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Trade Conditions

LESSONS FROM THE BRITISH INDUSTRIES FAIR

ALTHOUGH the attendance has been lower it would be wrong to assume that this year's British Industries Fair was not a success from the point of view of its primary purpose, the promotion of home and, more especially, overseas trade. There have been plenty of buyers from abroad and more than enough orders to absorb all the raw materials which manufacturers can expect to have at their disposal in the predictable future.

Uncertain Dates and Prices

With the return of the seller's market it is, however, difficult to estimate the actual value of orders and inquiries. In many instances, in view of the uncertainties regarding raw materials it is possible to give neither definite delivery dates nor definite prices. Reports received therefore of overseas orders for certain domestic appliances valued at many thousands of pounds, though no doubt authentic enough, do not appear to take into consideration the almost inevitable shortage of raw materials.

In the circumstances, prospects for the home market are indeed far from bright, especially in the domestic appliance field. Most manufacturers are now reverting to the practice of giving preference to overseas customers and many products are now once again available only for export. The hapless home buyers, even of appliances such as refrigerators, washers, television sets, etc., on which purchase tax has recently been doubled, are faced with delivery dates receding rapidly into the dim future. And, of course, it must not be forgotten that after 30th June, unless some unforeseen improvement in supplies occurs, production of a number of appliances embodying copper and zinc will be discontinued and by the autumn there will be shortages in the shops, in some cases as bad as during the war.

Possible Substitutes

When the leeway in rearmament has been made up and when manufacturers have exercised fully their ingenuity in using substitute materials, it will be possible to expect some amelioration of conditions. The more extensive use of aluminium, the most obvious step, has its limitations both with reference to suitability and availability, but a profitable line of action appears to lie open in the employment of non-metallic substitutes, as already instanced in the washing machine industry where plastic materials are now being used for agitators and side panels.

It is to be hoped that eventually development of new sources of supply and production will overcome the shortage of raw materials. That, however, must take some time. In the immediate future this country is very largely dependent for certain raw materials on what the United States is prepared to release from the stocks which it has been building up during the past two or three years. It is to be hoped that the United States will realize that it is not in its ultimate interest that British manufacturers of a wide and important class of goods should be unable to maintain at least a small production of goods for the home market.

SOUTH AFRICAN POSITION

In a recent speech Mr. A. M. Jacobs, chairman of the South African Electricity Supply Commission, said that they were approaching a period when increase in demand was expected to be greater than the rate of commissioning of new plant. It had therefore been necessary to ask all consumers to reduce their present maximum demands by 10 per cent and the Commission was postponing the connection of new load unless the interests of the national economy made it necessary. The Commission has a £54 million programme in hand and hopes to be able to meet all demands within the next three years. In view of Sir John Hacking's recent statement that it was necessary to plan a station six or seven years ahead it is worth noting that since the war the time lag in South Africa has been seven years. In this case the necessity of placing orders overseas is the principal reason for the delay; here it is largely due to the need for obtaining the consents of a number of interested parties.

LOAD CONTROL

In a letter to *The Times* Mr. F. J. Erroll criticized Sir John Hacking's recently expressed view that " it would be unwise to direct labour, material and capital to produce equipment for artificially limiting consumers' demand for such purposes which could be more profitably employed in building new generating plant." The absence of a comma before " which," in our view, absolves Sir John from the charge of prejudging the results of the large-scale tests now being carried out, as the statement is equivalent to " if the labour, etc." In any case, whereas the provision of enough plant would end restrictions on the use of electricity, load control would perpetuate them in another form.

LOAD-CURVE IMPROVEMENTS

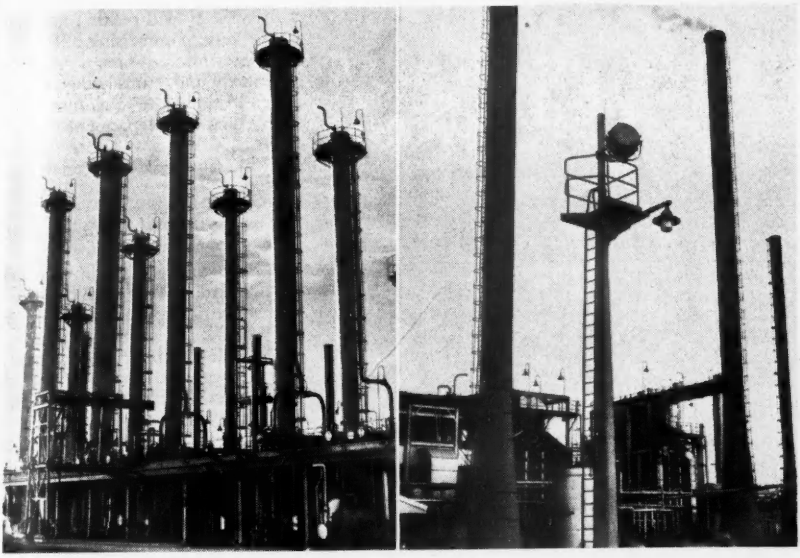
Restrictions are justifiable, we consider, only for meeting a passing, even if prolonged, emergency. Price differentiation intended to smooth the load curve has a longer-term value, for example the classification of supplies into firm and non-firm, the latter relay-controlled and charged at a lower rate. Even power station auxiliaries are sometimes graded as essential and non-essential with priority for the former. Other aspects are discussed by Mr. W. Walsh on page 1027. Improvement of load factor has always been an aim of supply engineers, and this has been canalized by certain recommendations of the Clow Report in regard to detailed (and probably lengthy) research into the whole subject.

FIRST-COMERS' RIGHTS

It is patently unfair that a consumer who has paid the major part of the cost of a service line should not be able to recover some part of his outlay when subsequent comers are connected to the line. The matter, which is a live topic in this country, was recently discussed at a conference held under the auspices of the Association of Electrical Undertakings, Bombay Province. It seems to have been the general view that the electricity authority could not undertake to refund part of the cost but a prospective consumer might be told that this cost would not be so heavy if he undertook to secure further connections. One member said that his practice was to require later applicants for a supply to obtain the permission of the consumer who had paid for the line. His company then acted as a " benevolent arbitrator " in the settlement of any disputes.

X-RAY DOSAGE

It is common practice in radiotherapy, providing certain data are available, to control treatment by time of exposure alone. Risk of possible error may be reduced by the use of an integrating dosemeter, but commercial instruments of this kind are usually priced at over £200. It is therefore pleasing to note that such a meter developed for use in the London Hospital, which reads directly in skin dose, has been made commercially for about £60.



Stanlow Oil Refinery

Electrical Scheme for New Extensions

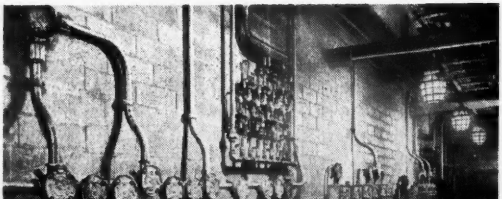
SINCE we prepared our recent series of articles indicating the use of electricity in the oil industry (*Electrical Review*, 17th November, 1950 to 5th January, 1951) we have had an opportunity of visiting the Shell Oil Refinery at Stanlow, Ellesmere Port. In general the methods adopted are similar to those noted at the Royal Dutch/Shell installation at Pernis, near Rotterdam, but as the British scheme is considerably further advanced than was that at Pernis when we were there, it is now possible to give a more detailed picture of the practices employed.

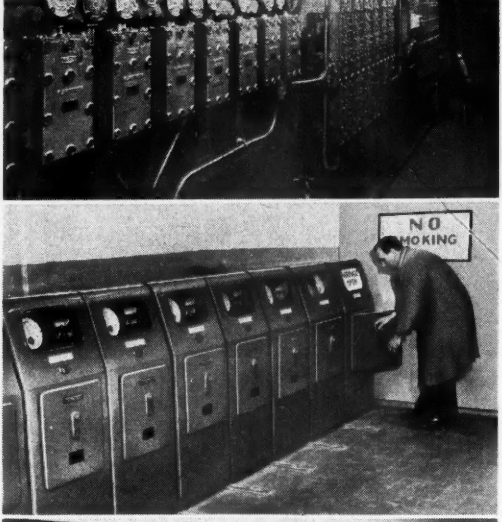
Stanlow is the largest of the "Shell" Refining and Marketing Company's four refineries in this country, the other three being at Shell Haven, Heysham and Ardrossan. The original plant, begun in 1924 and occupying a site of about 40 acres, was engaged solely in the production of bitumen. Between 1937 and the outbreak of the war activities were extended to cover lubricating oils, hydrogenation and ester salts plants also being added. The tankage area was extended during the war on a 1,000 acre site.

In 1946 a further stage was commenced with the development of the Stanlow South site, involving the erection of chemical works, crude oil distillation plant, doctor treater, reforming unit (a high temperature cracking unit for obtaining high grade spirit from naphtha) and catalytic cracking plant (for converting gas oil to high grade oil). All these plants are now in operation except the last-mentioned unit which is due for completion within the next few months.

At present the refinery is distilling daily 4,000 tons of crude oil, besides treating another 6,000–8,000 tons, but before long, as the installation is completed, the distilling

Above left: Fractionating unit for chemical plant. Above right: Floodlights mounted on concrete standards are used for exterior lighting





Top: Flameproof relays for handling alarm and alarm cancellation signals

Centre: Bank of medium voltage switches in an area substation

Bottom: Area substation showing how the building is divided into two separate halves. The h.v. switchgear is on the right, the medium voltage gear on the left

capacity will reach 12,000 tons a day, comprising oils of all descriptions—fuel, lubricating, medicinal, transformer, etc. In addition, the chemical plant, which is dependent on the other sections of the refinery for its raw materials and fuel, is turning out such products as alcohols and ketones at the rate of about 2,000 tons a month.

In view of the ever-present hazards arising from the sudden shutting-down of all or individual sections of the plant, the whole of the electrical system throughout the refinery has been duplicated. Two separate 33 kV incoming supplies from the Merseyside and North Wales Electricity Board are transformed to 6·3 kV at an outdoor substation equipped with English Electric switchgear and four (two pairs duplicated) 7·5 MVA transformers.

The 6·3 kV supply from the Board is received at a central control point adjacent to the outdoor substation via two Switchgear & Cowans 250 MVA switches. Here the supply for the whole refinery area is metered and fed out at 6·3 kV to the fourteen local substations serving the different units of the plant. A mimic diagram covers the switching arrangements for the whole system. Housed in the same building are the batteries for the solenoid actuating gear of the switches, and the transformers and switchgear for the local supplies.

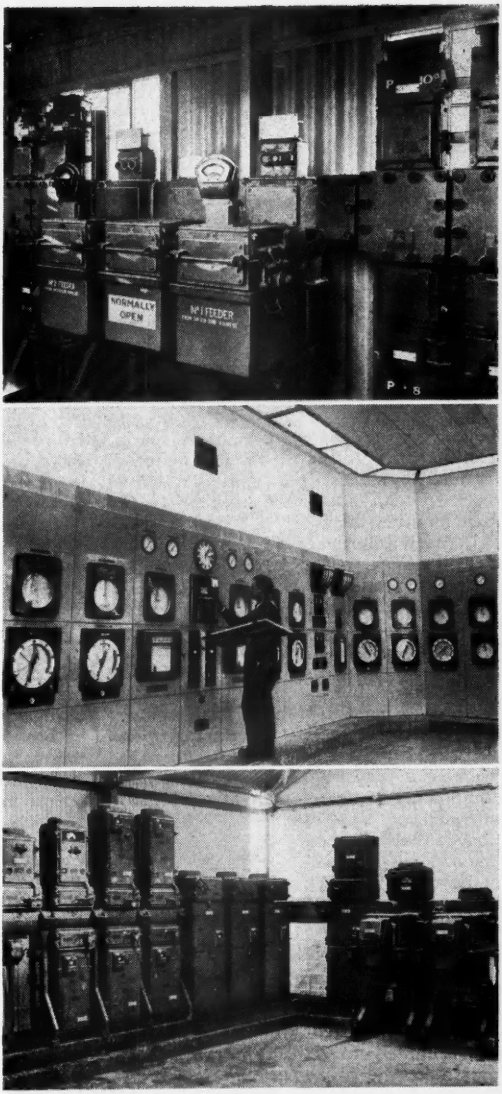
The layout and equipment of the local substations has been standardized throughout. Each building is divided into two identical halves with sliding doors between. Each half is fed from a different source of supply with provision for interconnection and is designed to handle 6,000 kVA. Seven Ferguson, Pailin 150 MVA h.v.

switches control the supplies both to the larger motors operating on 6,000 V and to the Brush 1,000 kVA 6,300/415/240 V transformers providing for the smaller motors and the lighting. Facing these h.v. switches are eight Yorkshire Switchgear 25 MVA totally enclosed switches controlling the medium voltage supplies. Warming of the substations is effected by means of Spiral Tube fan heaters controlled by Teddington thermostats and humidistats. The transformers are situated in the open on sites adjoining the building.

In the case of some of the larger production units it has been necessary to provide additional transformer substations, each again with duplicate 1,000 kVA 6,300/415/240 V transformers for the medium voltage supplies. No h.v. switchgear is provided in these auxiliary substations.

From the substations the h.v. supplies for the larger motors (200 h.p. upwards) are taken to control rooms in "safe areas" adjacent to the section of the refinery served; the switchgear, which is of the standard industrial type (non-flameproof), comprises solenoid operated circuit breakers. The M. & C. starters (also non-flameproof) for the medium voltage motors are mounted also in "safe areas" well away from the motors they control, to form group starting panels, the 60 halves of which are in most cases separately supplied. "Safe areas," in which it is the practice to use non-flameproof gear, are defined as over 50ft from possible sources of inflammable gas.

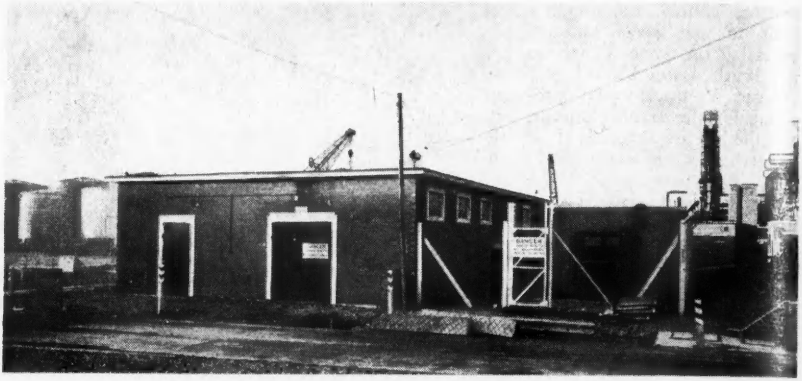
The group motor starter panels are protected from the weather by corrugated iron roofing but are otherwise open to the air, thus further reducing the risk of producing an



Top: In the butane pressure storage area it is dangerous to have non-flameproof switchgear even 50ft from the plant so a special substation has been provided

Centre: Central control room for the reformer unit, showing indicating and control instruments and also the recessed trough ceiling lighting panels

Bottom: H.v. switchgear situated in a "safe area" for remote operation from the push-button adjacent to the motors



One of the area substations at the Stanlow refinery

explosive atmosphere in confined spaces. The actual control of the motors is effected manually by means of push-buttons mounted together with ammeters adjacent to the machines they drive.

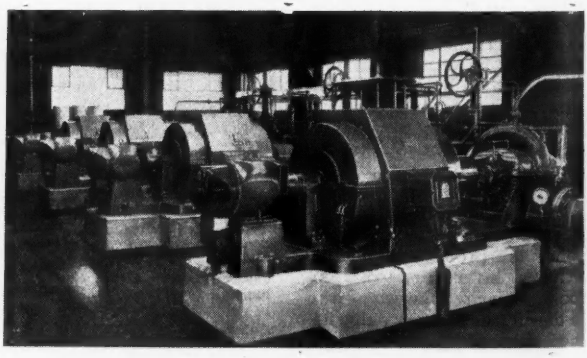
In view of the general adoption of direct-on-line starting even for the h.v. motors, separate 240 V feeders and group control panels are provided for lighting in order to prevent interference. These feeders are quite distinct from the duplicated medium voltage supplies for the group motor control panel.

About 95 per cent of the motors employed are utilized for centrifugal pumping operations, the remainder being required to drive compressors, mechanical handling equipment, etc. Motors up to 200 h.p. are operated on 240 V, above that size on 6,300 V. Nearly all of them are Metrovick flameproof squirrel cage type arranged for direct-on-line starting. They are designed to start up against a closed delivery valve, the starting current being limited to six times the full load current in the case of the smaller machines and to four and a half times full load current in the case of h.v. motors. With a starting torque of 60 per cent the motors attain their full speed in about 11 sec. All the motors are equipped with overload and under-voltage protection, units of 25 h.p. and over also having earth leakage protection.

The motors used range in size from about 1 h.p. up to 400 h.p. The four largest machines, 6,000 V auto-synchronous units, drive the cooling water pumps. As already indicated virtually all production equipment is duplicated. In a typical interception unit used to remove water from oil three pumps are provided with a change-over scheme enabling any one to be brought into operation as desired, so as to give equal wear.

To secure so far as possible automatic operation and also to draw attention to any

The cooling water pumps for the chemical plant are driven by 400 h.p. 1,000 r.p.m. motors



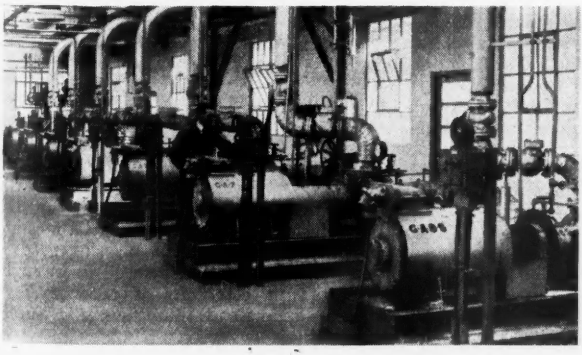
Group motor starting panel open to the air to reduce explosion risk

abnormal conditions arising in the plant extensive use is made of electrical indicating and recording devices and a central control room housing them is provided for each main section of the plant. Instruments utilized include Evershed & Vignoles tank level gauges; Budenberg pressure gauges; Foxboro' pressure, temperature, and flow recorders and controllers; Alex. Wright furnace pressure and draught gauge and control; Elliott automatic CO_2 recorder for flue gases; Brown multi-point distance thermometers and temperature recorders; and Kent multi-point continuous temperature recorders. Londex flameproof relays are used for handling alarm and alarm cancellation signals.

For the general lighting of the pumphouses a lighting intensity of about 10 ft-candles has been adopted as standard but in the control rooms an overall lighting intensity on the instrument panels comes from recessed trough type ceiling panels forming part of the general decorative scheme. For exterior lighting "Blaizolite" floodlights incorporating two 1,000 W tungsten lamps are mounted on Concrete Utilities standards. As a warning to aircraft, red lights are fitted to the cooling tower at the top and half-way down.

Although braided v.i.r. cable in conduit is generally employed for the wiring installation, with "Pyrotenax" in special cases, a weatherproof trunking system has been developed which is being employed for extensions now in hand. All the pumps are connected with armoured cable.

About 95 per cent of the electricity supplied is used for pumping. Here is the doctor treater pumphouse showing the starter push-buttons and ammeters mounted near each machine for remote control of the starters



The electrical installation contractors for the scheme are T. Clarke & Co., Ltd. Almost all the motors were supplied by the Metropolitan-Vickers Electrical Co., Ltd., the group control starter panels being by M. & C. Switchgear, Ltd. Ferguson, Pailin h.v. switchgear is mainly used, with Yorkshire medium voltage gear. G.E.C., Walsall and Simplex equipment has been mostly selected for lighting.

VIEWS on the NEWS

By REFLECTOR

THE Festival of Britain is bringing many incidental benefits to the much-neglected right bank of the Thames in London. Apart from the brightening of Waterloo Station and the complete reorganization of the traffic arrangements, there are a number of lighting improvements. One of them should particularly gladden the hearts of the *Electrical Review* staff. It is the replacement of gas lighting by electricity in Stamford Street. Unfortunately I find that it is only the Lambeth section of the street that is being equipped; Southwark, in which the *Review* offices are situated, is sticking to gas for the time being. I am told by the Lambeth Borough Council that the change-over (which will cover a large part of the borough) was to be made anyway; the Festival merely speeded-up the process.

* * *

It seems that most employees of national boards must have properly descriptive titles even if these are of inordinate length. When one of these is included with the individual's name and title on an envelope and the address of the division, section, area, sub-area or district to which he belongs is added the result is a good deal of reading matter. One would have thought that the Post Office would have welcomed some simplification, but does it? The secretary of the North Western Division, B.E.A., suggested (soon after vesting day) what seems to me to be a reasonable reduction of the Division's address from six lines to three. He received the reply that "failure to use a full and correct address on anything sent by post is liable to result in delay, or the postal packet being returned to the sender." And so the waste of time goes on.

* * *

A Royal Commission here has confirmed the undesirability of State lotteries but in Russia, strangely enough, they seem to be regarded differently. Moscow Radio recently gave some details of a new State loan to be raised by lottery. It is intended to use most of the proceeds for financing some of the large hydro-electric developments now in hand in Russia. This is hardly a system the B.E.A. would care to adopt, I think.

* * *

A law has been introduced into the Pennsylvania Senate (says the *Electrical World*) "requiring all electric power companies to maintain and operate power lines so that current delivered to household consumers would be rated voltage at all times without diminution or stoppage at any time." In palmier days than these a similar sort of law was passed in England (Electric Lighting (Clauses) Act, 1899) by which only "inevitable accident or *force majeure*" excused electricity undertakings from maintaining their supply. The Act is still on the Statute Book but to-day *force majeure* (in the shape of lack of plant) is a continuing factor. Perhaps conditions are better in the State of Pennsylvania.

* * *

At a meeting of the Instow (Devon) Parish Council reference was made to complaints about the public lighting in the parish. A letter was read from the district manager of the South Western Electricity Board in which he offered a supply of cards on which councillors could quickly inform the Board of any defects. The offer was accepted, one member suggesting that the D.M. should supply a hundredweight.

* * *

Mr. C. Singleton, an official of the Welsh Gas Board, is reported by the *South Wales Argus* to have said at a meeting that in addition to being pleasing by day, gas showrooms should be well lit by night "even with electricity if necessary." I cannot understand that "even"; surely electricity is necessary.

Power Station Efficiencies

Calculations Simplified for Beginners

By F. STEVENSON

WHEN we speak of the thermal efficiency of a power station we mean the ratio between the British thermal units in the generated electricity to the British thermal units (B.Th.U./lb) in the coal consumed.

One power station may have a higher thermal efficiency than another yet it will cost more per kWh produced to generate electricity in the former than in the latter. It is necessary to try to obtain a correct balance between additional capital expenditure on the more efficient plant and the extra expense of consuming more coal in the less efficient station.

Before we can make the necessary calculations we must know the total amount and quality of the coal consumed, the total water evaporated, average steam pressure of boiler and superheater, inlet and outlet temperatures of economizer and circulating water and the vacuum in the condensers.

This information can be obtained from the hourly readings entered on the log-sheets. Coal samples are analysed for ash content and moisture, and the average calorific value of dry coal is arrived at and brought down to standard values.

A pound of dry coal of 7,000 calories has a standard value of 12,600 B.Th.U. so that if, for example, 1,000 tons of coal is used and the analysis shows 7,350 cal/lb and 12·5 per cent moisture we proceed to find a factor as follows:—

$$\frac{7{,}350 \times 100 - 12{\cdot}5}{7{,}000 \times 100} = 0{\cdot}919$$

Thus, 1,000 tons × 0·919 = 919 standard tons.

For working out these thermal efficiencies standard coal of 12,600 B.Th.U. will be assumed and one kWh of electricity having a heat value of 3,412 B.Th.U. Take, for instance, a power station consisting of a 50,000 kW turbo-alternator and boiler plant with the usual economizers, steam at 300 lb/sq in absolute and superheaters raising the temperature to 700 deg F.

For the sake of making these calculations easily understood we will assume a straight turbine without steam bleeding at the low pressure end, using steam at the rate of 9 lb/kWh generated with an output of 4 million kWh per week of seven days and using 1·1 lb of coal per kWh.

If we refer to steam tables we find that steam at a pressure of 300 lb/sq in absolute has a temperature of 417·4 deg F and contains 1,204·3 B.Th.U./lb from and at 32 deg F. If this steam is superheated up to 700 deg F further heat units will have been added without increasing the pressure.

To find the total heat units we must now examine the steam curves of dry saturated and superheated steam at 300 lb/sq in pressure. This gives us a mean specific heat factor of 0·58 so that:

$$700 - 417{\cdot}4 \times 0{\cdot}58 = 163{\cdot}9 \text{ B.Th.U.}$$

which added to 1,204·3 = 1,368·2 B.Th.U. Thus the superheater has given us an additional temperature of 282·6 deg F and 163·9 B.Th.U./lb of steam.

We can now proceed to calculate the efficiency of the boiler plant, which includes economizers, boilers and superheaters. The efficiency is the ratio between the heat in the steam to the total heat in the coal. As stated above, the boilers evaporate 9 lb of steam with 1·1 lb of coal. The efficiency of the total boiler plant is:

$$\frac{1{,}368{\cdot}2 \times 9 \times 100}{12{,}600 \times 1{\cdot}1} = 88{\cdot}8 \text{ per cent}$$

The boiler efficiency is:

$$\frac{1{,}204{\cdot}3 - 180 \times 9 \times 100}{12{,}600 \times 1{\cdot}1} = 66{\cdot}5 \text{ per cent}$$

The superheater efficiency is:

$$\frac{163{\cdot}9 \times 9 \times 100}{12{,}600 \times 1{\cdot}1} = 10{\cdot}6 \text{ per cent}$$

The economizer efficiency is:

$$\frac{212 - 32 \times 9 \times 100}{12{,}600 \times 1{\cdot}1} = 11{\cdot}7 \text{ per cent}$$

The heat loss is therefore 11·2 per cent,

which gives us a total heat balance for the boiler plant as follows:—

Boilers	66·5 per cent
Economizers	11·7 ,,
Superheaters	10·6 ,,
Heat losses	11·2 ,,
Total	100

The thermal efficiency of the turbo-alternator is the ratio between the total heat units in the electricity generated to the total heat in the steam. In practice there will be a slight loss of heat in the steam mains, but if we assume the full steam pressure and temperature at the turbine stop-valve the efficiency is:

$$\frac{3{,}412 \times 100}{1{,}368{\cdot}2 \times 9} = 27{\cdot}7 \text{ per cent}$$

The gross thermal efficiency from coal to electricity generated is:

$$\frac{3{,}412 \times 100}{12{,}600 \times 1{\cdot}1} = 24{\cdot}6 \text{ per cent}$$

It will be seen from the above that the turbo-alternator efficiency (which includes the ejector) is only 27·7 per cent.

Even the most perfect turbine cannot utilize all the heat in the steam. The limits are imposed by the steam cycle. If steam is expanded down to 29in of vacuum there is still 876 B.Th.U./lb left and this is passed on to the condenser; the only heat saved is that which heats up the condensate, which is passed back again to the boilers.

At 29in vacuum the temperature will be 78·9 deg F. This, however, contains the 32 deg F so the latter must be subtracted from the condensate temperature, which leaves 47 B.Th.U./lb. The remainder of the heat is wasted in heating up the circulating water, which is returned to the river. Unfortunately we are unable to utilize the heat which is wasted, for at this vacuum there is no temperature difference to cause the heat to flow to water-heaters, etc., and back again to the condenser.

The full losses to the condenser as seen from the above figures will be 1,368·2 — 876 less 47 or

$$\frac{829 \times 100}{1{,}368{\cdot}2} = 60{\cdot}6 \text{ per cent}$$

This is slightly reduced if we make allowance for gland steam.

The total heat that can be converted to mechanical energy in the turbine is 1,368·2 — 876 = 492·2 B.Th.U./lb of steam. We have saved 47 B.Th.U./lb of steam in the condensate so the steam cycle will be as follows:—

$$492{\cdot}2 + 47 = 539{\cdot}2$$

$$= \frac{539{\cdot}2 \times 100}{1{,}368{\cdot}2} = 39{\cdot}4 \text{ per cent}$$

The condenser loss = 60·6 per cent
Total steam = 100 per cent.

To simplify the above calculations so they can be easily understood, the temperature of water in the hotwell is assumed to be 32 deg F and the economizers raise this to 212 deg F. In practice it will be much higher as the condensate to the hotwell will be at 78·9 deg F and this figure will be increased by the waste heat issuing from the steam glands and steam traps.

It will also be necessary to provide for make-up losses, which are chiefly due to boiler blow-downs and soot-blowers. This make-up will be about 4 per cent of the total boiler feed-water and should be supplied from evaporators and calculated in the total boiler evaporation. When the net thermal efficiency is required all electricity used for driving the boiler and power-house auxiliaries should be deducted from the total kWh generated.

Purchasing Officers' Conference

THE Purchasing Officers' Association is holding a Scottish and North of England one-day conference at the North British Station Hotel, Edinburgh, to-morrow (Saturday). The National Council of the Association is meeting at the same hotel this evening.

The programme will include papers on "The Purchase of Castings" by Mr. F. J. White (Chance Bros., Ltd.), and on "Economic Efficiency" by Mr. A. Elliott (Churchill Machine Tool Co., Ltd.). There will be an "Ask Your Questions" session in the form of a "Brains Trust" on purchasing topics, with members of the National Council forming the team, and group discussions running concurrently will consider such subjects as "Reciprocal Trading," "Material Controls and Priorities" and "Purchasing Publications." Although the conference is primarily intended for members of the Association's branches in Scotland and on Tyneside, other purchasing officers have been permitted to attend and participate in all conference sessions.

Electricity Tariff Problems

Proposed Solution and Some Objections

By W. WALSH, A.C.I.S.

IN an article on "Electricity Tariffs in Theory and Practice" appearing in the *Economic Journal* for March, Professor H. S. Houthakker has produced a concise, clear and commendably brief review of existing electricity tariffs in the United Kingdom. His economy of description in particular commends itself to anyone wishing to grasp the practical difficulties of tariff framing and tariff policy easily and quickly. That is not to say, however, that the paper reduces to absurd simplicity the problems inherent in peak load difficulties. There is indeed a ready recognition of the complexities attendant on any effort made to simplify both the cost and pricing principles upon which modern tariff practice is based, and a willingness to concede the difficulties involved in standardization.

Analysis of Costs

A brief introductory note indicates the purpose of the paper: to study the problems of electricity tariffs both theoretically and practically with a view to easing present difficulties (the peak-load problem) and relating electricity tariffs to the broad picture of welfare economics. More briefly the fundamental characteristics of the industry are noted: its inability to store its product and its complete selling monopoly. Then an examination of the basic make-up of costs is made; capacity costs representing the expenses necessary to install, maintain and operate generating equipment, energy costs representing the net cost of producing and transmitting energy, consumer costs of metering and accounting, and residual costs not strictly assignable to any of these heads. Following these definitions the principal types of tariffs are reviewed, and there is some comment on seasonal tariffs with a more critical examination of the "Clow" surcharge in relation thereto, than this unhappy experiment consciously warrants.

In the main body of the paper there is an examination of the two related aspects of the application of marginal cost principles to electricity supply and the basing of tariffs on these principles to yield marginal cost pricing. If this sounds rather frightening it need not be; the theoretical considerations inherent in the principle of marginal costs are simply explained. In fact there is a tendency to over-simplify the issues involved which is understandable given the length of the paper as a whole. Tariffs based on marginal costs do, however, introduce an aspect of pricing in relation to demand which must be challenged, but which can more clearly be related to the conclusions Professor Houthakker gives. It is, however, somewhat puzzling to read (at p. 14) a rejection of different running charges for peak-time and off-peak consumption, as a method of flattening the load curve, and to find in the next paragraph a whole-hearted commendation of a time-of-day tariff (with a high unit rate for consumption in peak hours and a low rate for off-peak consumption). This may be a forgivable slip on Professor Houthakker's part.

The final section of the paper (apart from a recapitulation of the conclusions reached in that section) takes us through the more practical labyrinths of the peak-load problem, especially in relation to domestic and space heating loads and the costs (capacity costs) involved in providing the generating equipment necessary to meet those loads.

"Unrealistic" Charges

It is to this section that one must pay the most critical attention for it examines in relation to the facts established previously, the whole basis of present-day charges and dismisses them (with a relatively minor exception of flat rate tariff with meter rent) as being unrealistic relative to the problem of peak loads. In fact, the conclusion reached by Professor Houthakker is that control of peak loads ought to be attempted by means of prices.

Towards this end his ultimate recom-

mendation is that a time-of-day tariff offers an eventual solution to the problem, if the price of energy in the peak periods is made to correspond, as near as is practicable, with " capacity costs " and the price of off-peak energy is made to correspond with " energy costs." This would involve a charge (based on 1948 prices) of 3·1d/kWh during five hours of the day (roughly 8–10.30 a.m. and 3.30–6 p.m.) and ¦d/kWh during the remainder of the day with no fixed charges for either domestic or industrial consumers.

Part-load Control

Appreciating the technical difficulties involved in two-rate metering, the author suggests that for small domestic consumers flat rates or a combination of flat rate and " non-firm supplies " (i.e., with part of the load relay controlled), should be standard and that the time-of-day tariff should be introduced initially to large domestic consumers and industrial consumers. The two-part tariff, on which the industry was built, is thoroughly condemned for its promotional aspect and because it leads to over-investment in electrical equipment.

There are two aspects of these conclusions which appear worthy of more than a passing glance. In the first place the whole conception of over-investment in electricity supply is open to question. That is not to say Professor Houthakker has been partisan in his approach, there is indeed much evidence that it has been dispassionate and scientific, but while the need of the country is for more and more production per man-hour, and while the reports of the many Anglo-American Productivity Teams stress the much greater use that could be made of electrical power in industry, any tariff which places a premium on such electrification stands condemned.

Differentiation Between Consumers

A secondary point which arises in this connection is the ability of the industry to differentiate between consumers. It can do this but the decision ought to lie elsewhere as to whether in fact it should, and if it should *not* then the price squeeze affects all industries, not according to their relative usefulness to society, but according to the time of day in which they most need energy. Thus the more basic industries, where the processing of materials is continuous, must suffer a penalty in comparison with those less necessary, where the work load can be more successfully shifted.

To some extent this is true to-day under maximum demand tariffs, but judging from the success of load spreading arrangements it would appear that the reward for load spreading is insufficient to cover the costs involved, or perhaps insufficient to overcome ordinary inertia. A tariff which offered supplies at one-seventh of peak rates would be more likely to overcome the inertia or cost problems, relatively small though electric power costs are to total costs. If the time-of-day tariff did not persuade industry to make the change it would leave the peak problem untouched ; if it did then the penalizing effect on essential services and industry would come into force.

Possible Adverse Effects

So far as domestic consumers are concerned the question of investment becomes tied up with price. Professor Houthakker recognizes the peculiar nature of the problem where consumers pay in arrears for their consumption by acknowledging that it might be one or two years before results would become apparent from the introduction of a time-of-day tariff. In assuming that a *future* price will cause demand to become so elastic as to reduce demand by 0·25 kW per consumer at *all* peak periods some injustice is done. It is not merely that electricity is relatively cheap that secures its use: it is also clean, it is easily available and is *not rationed.*

Heating, cooking and water heating which account for the highest proportion of the domestic load must be done somehow. If the alternatives to electrical equipment and the means of using the alternatives were readily available then the case for the time-of-day tariff would be considerably strengthened. While they are not, the case for the piecemeal re-introduction of the price mechanism is equally weakened.

No industry willingly pursues a restrictionist policy, despite the theoretical conclusions arrived at by a study of marginal cost principles. It is not true to say that the correct prescription for the industry's ills is to promote a tariff which will have far-reaching consequences not only on its peak problem but the greater future problem of developing off-peak loads. A tariff which discourages the purchase of

equipment which might out of necessity be used only at penalty rates during five hours of the day, also discourages the use of that equipment altogether. The eventual effect then is not only to relieve the peak but also to reduce the off-peak load too. The relative depressions may not be the same (they are unlikely to be so) but the relationship may only be discovered after the experiment and after the dissipation of much more good will than the "Clow" surcharge ever achieved.

Professor Houthakker has made a material contribution to the study of electricity tariffs and he has been bolder than many in presenting concrete conclusions. As a basis for discussion his paper is excellent, although one may quarrel with him as to the practicability of his suggestions for the immediate relief of the peak problem, and disagree far more about the ultimate consequence of his suggestion. It is nevertheless refreshing to read the views of someone who quite patently has no private axe of his own to grind.

Swiss Electrical Exports

EXPORTS of electrical manufactures from Switzerland increased in value last year, compared with 1949, in nearly all lines. In dynamo-electric machinery the advance was about 20 per cent, in radio apparatus over 25 per cent, and in unspecified apparatus about the same. The only substantial decline was in cable exports which were approximately half the 1949 value. Small decreases occurred in telephone and telegraph apparatus, and in meters which were distributed to no fewer than 53 countries. Swiss electrical exports sold largely in Europe, some even in countries behind the "Iron Curtain," besides going to many Latin-American countries. There was a noteworthy shipment of electric locomotives to French Africa. The accompanying table shows the values of the principal groups and some leading destinations in 1950, with notes of increases or decreases compared with 1949.

Class of Goods	1950 Sw. fcs. (000)	Inc. or dec. on 1949 Sw. fcs. (000)
Accumulators	3,163	+ 479
To France	1,176	+ 699
„ *Italy*	335	+ 112
„ *Czechoslovakia*	160	+ 116
Insulators	1,924	+ 154
To Belgium	369	+ 289
„ *Holland*	389	− 206
„ *Czechoslovakia*	168	+ 96
„ *Austria*	148	+ 45
Meters and measuring instruments	29,112	− 756
To France	3,546	+ 958
„ *Italy*	2,948	+ 945
„ *Belgium*	2,411	− 1,980
„ *Holland*	3,456	+ 626
„ *Sweden*	2,070	+ 1,016
„ *Czechoslovakia*	1,889	+ 1,272
Insulated wire and cable	1,943	− 2,038
Dynamo-electric machines	99,442	+ 18,259
To France	8,602	+ 3,332
„ *Spain*	4,743	+ 1,975
„ *Poland*	3,970	− 3,737
„ *Czechoslovakia*	7,468	+ 5,719
„ *Belgium-Luxemburg*	8,877	+ 1,426
„ *Finland*	4,077	+ 189
„ *Holland*	3,886	+ 43
„ *Norway*	5,114	− 1,344
„ *Argentina*	8,882	+ 4,314
„ *Brazil*	3,925	− 2,450
„ *Portugal*	3,236	+ 696
„ *India*	2,238	− 710
„ *Peru*	4,237	+ 2,996
Radio apparatus	11,196	+ 2,642
To Germany	3,609	+ 1,252
„ *Italy*	691	+ 258
„ *Belgium-Luxemburg*	598	+ 220
„ *Holland*	667	− 46
„ *Hungary*	963	+ 294
„ *Bulgaria*	635	+ 628
„ *Rumania*	695	+ 588
Telegraph and telephone apparatus	7,826	− 65
To Holland	2,771	+ 492
„ *Israel*	938	+ 926
„ *Italy*	975	+ 340
„ *Greece*	401	+ 399
Electric incandescent lamps	759	+ 105
To Germany	380	+ 155
Unspecified electrical apparatus over 500 kg.	23,060	+ 10,179
To Holland	1,380	− 170
„ *Spain*	998	+ 257
„ *France*	2,549	+ 1,750
„ *Belgium-Luxemburg*	2,040	+ 1,577
„ *Ireland*	2,656	+ 2,218
„ *Argentina*	1,611	+ 1,519
„ *Canada*	1,373	+ 1,129
„ *Portugal*	1,975	+ 1,715
„ *Poland*	1,155	+ 560
Ditto 50 to 500 kg.	20,810	+ 5,272
To Belgium-Luxemburg	2,231	+ 251
„ *Czechoslovakia*	1,179	+ 446
„ *Holland*	1,381	− 18
„ *France*	1,679	+ 837
„ *Norway*	1,552	+ 508
„ *Ireland*	1,282	+ 1,070
„ *Argentina*	1,342	+ 1,070
„ *Sweden*	770	+ 133
„ *Brazil*	673	− 191
Ditto 3 to 50 kg.	21,463	− 480
To France	2,758	+ 953
„ *Belgium-Luxemburg*	2,219	− 915
„ *Holland*	1,709	− 1,101
„ *Spain*	1,015	+ 472
„ *Italy*	1,118	+ 31
Electric locomotives	9,484	+ 7,511
To Belgium-Luxemburg	429	− 645
„ *France*	1,865	+ 1,865
„ *French Africa*	6,539	+ 6,539

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE British Electricity Authority announces the appointment of three divisional controllers. They are **Mr. H. V. Pugh**, M.I.E.E., M.I.Mech.E., at present divisional controller, South Wales, to be controller of the London Division on the retirement of Mr. J. N. Waite, C.B.E., M.I.E.E., F.Inst.F.; **Mr. L. F. Jeffrey**, B.Sc., M.I.E.E., M.Inst.C.E., M.I.Mech.E., at present chief generation engineer (construction), Midlands Division, to be controller of the East Midlands Division, on the retirement of Mr. W. S. Burge, M.I.E.E.; and **Mr. H. J. Bennett**, A.M.I.E.E., chief generation engineer (operation), London Division, to be controller of the South Wales Division in succession to Mr. Pugh.

Mr. Pugh received his general education in India, where he was born and where he served with the Indian Army. He was an apprentice with Burn & Co., Calcutta, and later carried on his training with the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, while also attending the Manchester College of Technology. In 1930, he was appointed chief electrical engineer to Cory Bros & Co., South Wales. Five years later he joined the South Wales Electric Power Co., as deputy superintendent at the Upper Boat power station, becoming superintendent of this plant as well as the Llynfi power station, in 1937. In 1944, he was appointed deputy chief engineer of the Manchester Electricity Department and held this position until 1948 when he became controller of the B.E.A. South Wales Division.

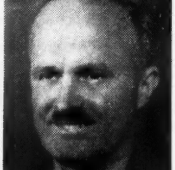
Mr. Jeffrey was educated at Whitgift School, Croydon, and received his practical training with James Keith & Blackman Co., Ltd. After demobilization from the Navy, in which he served in the first world war, he attended Battersea Technical College and London University. For three years, he was assistant mechanical and electrical engineer at the Beckton works of the Gas Light & Coke Co., after which he became assistant constructional engineer to the Birmingham Electric Supply Department. In 1936 he joined the West Midlands J.E.A. as technical assistant and construction engineer, becoming deputy chief engineer in 1938, chief engineer in 1942 and a senior executive officer in 1948.

Mr. Bennett was educated at Portsmouth Grammar School and Faraday House, where he was awarded a diploma. He became a junior engineer with the Portsmouth Corporation in 1921 and joined the Powell-Duffryn Co., two years later as charge engineer. In 1926, he went to the Padiham power station of the Lancashire Electric Power Co., as charge engineer. Three years later he joined the London Power Co., holding appointments successively at the Deptford and Battersea power stations. He became chief assistant engineer at Battersea in 1944, and was appointed chief assistant engineer (generation) of the London Power Co. in 1948 just before taking up his divisional post with the B.E.A.

Mr. T. G. N. Haldane, M.A., M.Inst.C.E., M.I.E.E., Fel.A.I.E.E., M.Cons.E., has accepted the invitation of the Executive Council to continue as president of the Association of Supervising Electrical Engineers for a second year. He will deliver his second presidential address at the opening meeting of the Association's London national lecture session on 16th October, at the Lighting Service Bureau, London, W.C.2.

Following the recent announcement that Mr. W. Puckey, director and general works manager, **Hoover, Ltd.**, will be "on loan" to the Government as Deputy Controller of Supplies (Air), certain changes have been made on the engineering side of Hoover, Ltd. Mr. B. H. Dyson has been appointed deputy general works manager, supervising the production side of all Hoover factories in Great Britain. Mr. W. J. Dimmock has

Mr. H. V. Pugh



Mr. L. F. Jeffrey

Mr. H. J. Bennett

been appointed works manager of the Perivale factory. Mr. A. Fisk becomes chief planning engineer, Mr. E. I. Laver, chief tool designer and Mr. H. J. Lloyd, assistant chief planning engineer.

Mr. **S. H. Callow**, a director of Siemens Electric Lamps and Supplies, Ltd., retired at the end of March but he is continuing to serve on several committees. Mr. Callow entered the service of Siemens Brothers Dynamo Works, Ltd., in 1907 and his long association with the manufacture and sale of lamps began in the following year when the first tantalum lamps were marketed in this country. He has been associated with Siemens Electric Lamps and Supplies, Ltd., since its formation. He was appointed general manager of the company in 1923 and in 1926 was made a director. He was entertained to lunch at the Holborn Restaurant, London, by members of the Siemens Electric Lamps and Supplies, Ltd. staff, when he received presentations from the staffs at Upper Thames Street, Caxton House, and Preston factory. For some years Mr. Callow has also been a senior executive of Siemens Brothers & Co., Ltd. Some of the directors and senior executives of Siemens Bros. entertained him to lunch in the library at Woolwich when a presentation was made.

Mr. S. H. Callow

Owing to re-arrangements in its General Engineering Department the Metropolitan-Vickers Electrical Co., Ltd., has made the following appointments as from May 1st :—

Mr. W. Eccles, M.Sc., A.M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., hitherto chief engineer, General Engineering, has been appointed chief engineer, Energy Application Engineering : **Mr. G. H. Jolley,** formerly the M-V Export Company's representative in Malaya, is appointed assistant chief engineer of this new department. The old General Engineering Department has been replaced by two new departments, Electrical General Engineering and Mechanical General Engineering. **Mr. N. R. D. Gurney,** A.C.G.I., M.I.E.E., has been appointed chief engineer, Electrical General Engineering, covering the industrial (including marine), mining and rolling mill sections, **Mr. W. E. Taylor** becoming consulting engineer, rolling mills, in this department. **Mr. W. J. Price,** B.Sc., is appointed chief engineer, Mechanical General Engineering, dealing with power station installations.

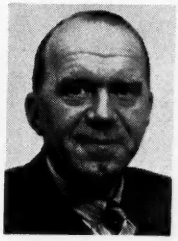
Mr. F. E. Rowland, M.I.E.E., M.I.B.A.E., Member A.S.A.E., the manager of the Agricultural Department of the General Electric Co., Ltd., is the new president of the Institution of British Agricultural Engineers. Mr. Rowland was educated at Charterhouse and the Northampton Polytechnic and is a well known authority on the application of electricity to agriculture. He started the Agricultural Department of the General Electric Co., Ltd., in 1929, and has been associated with the initiation of new uses of electricity in this field. His work has taken him to several European countries and to the United States and Canada. Mr. Rowland has served on technical committees of the I.E.E., E.R.A. and E.D.A., and he is a member of Council of the Association of Agriculture. He is also a member of the Committee and Drafting Panel of the Code of Practice for Farm and Horticultural Electrical Installations.

Mr. F. E. Rowland

The following changes are announced by the London Transport Executive :—**Mr. H. Branton,** who has been appointed generating superintendent (Lots Road), joined the Metropolitan Railway in 1930 and subsequently became generating station superintendent at

Mr. W. Eccles

Mr. N. R. D. Gurney



Mr. W. E. Taylor

Mr. W. J. Price

Neasden. He is succeeded at Neasden by **Mr. W. Ward,** assistant generating station superintendent (Lots Road). **Mr. D. S. Ryall,** A.M.I.E.E., assistant distribution engineer (trams and trolley buses) Northern Division, has been appointed substations engineer. **Mr. G. H. Long,** assistant distribution engineer (trams and trolley buses) Southern Division, has been appointed electrical equipment engineer in charge of Northern and Southern Electrical Divisions (trams and trolley buses).

The annual staff dinner and dance of **Ferranti, Ltd.,** held recently at the Midland Hotel, Manchester, was attended by Sir Vincent and Lady de Ferranti and among

Sir Vincent and Lady de Ferranti receiving the Mayor of Oldham, Alderman E. Kershaw, at the annual staff dinner of Ferranti, Ltd.

the guests were included the Lord Mayor and Lady Mayoress of Manchester and the Mayor and Mayoress of Oldham. Dinner was followed by an enjoyable evening's dancing.

Mr. J. S. Tait, Ph.D., B.Sc., A.R.T.C., A.M.I.E.E., A.M.I.Mech.E., has been appointed principal of the Woolwich Polytechnic as from 1st September next in succession to the late Dr. E. Mallett. Dr. Tait is at present head of the Electrical Engineering Department of the Northampton Polytechnic, London, E.C.1.

Mr. J. G. Holmes (Holophane, Ltd.), will take office as president of the Illuminating Engineering Society in October next in succession to Mr. L. J. Davies (B.T.H. Co.). **Dr. J. W. T. Walsh,** senior principal scientific officer in the Light Division of the National Physical Laboratory and well known internationally in lighting circles, has been awarded honorary membership of the I.E.S. of which he has twice been president, in 1929 and 1947.

Mr. R. W. Steel, M.I.E.E., chief commercial officer at the Area headquarters of the South Western Electricity Board, Bristol, has been appointed District Manager, Bath, in the place of **Mr. A. H. Milne,** M.I.E.E., A.M.I.Mech.E., A.M.I.I.A., who has been given the new appointment of assistant chief engineer (design) at the Bristol headquarters. Mr. Steel took up his new duties in April.

Miss Mary Gilbert, women's press liaison officer, British Electrical Development Association, is a keen member of the Soroptomist movement. She has been elected president for 1951-52 of the London and South Eastern Counties Divisional Union Council, which comprises twenty-four clubs.

Mr. J. W. Mayall, managing director of Mayall & Co., Ltd., electrical engineers and wholesalers, Birmingham, has been elected an alderman of Sutton Coldfield. Mr. Mayall, who is a past-president of the Electrical Wholesalers' Federation, has been a member of the Sutton Coldfield Council since 1935.

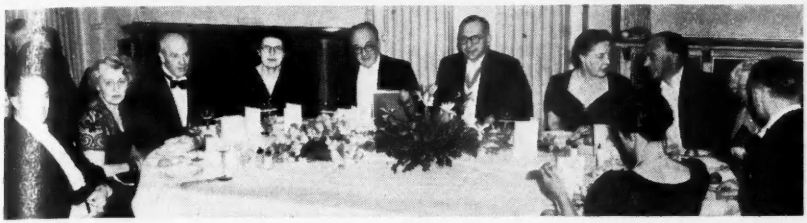
Commander C. F. Nock, D.S.O., R.N. (Retd.), sales director of the Tuscan Engineering Co., Ltd., and Tuscan Industries, Ltd., has resigned from the boards of both companies. Inquiries for the time being should be sent to the head office of the company at Bridgend, Glamorgan, or to Tuscan Industries, Ltd., at 100, Lough Road, Holloway, N.7 (telephone, North 2452).

Major H. J. Bullard, M.B.E., A.M.I.E.E., A.I.Mech.E., who left England in April, 1950, to take up the position of mechanical engineer with the Salisbury Municipal Electricity Department, Southern Rhodesia, has been promoted to senior mechanical and electrical engineer in the undertaking.

The Amateur Dramatic Section of the Victoria Works Athletic Club of **Johnson & Phillips, Ltd.,** successfully staged the drama "Night Must Fall," by Emlyn Williams, on 3rd, 4th and 5th May. The play was produced by A. Gearing and W. E. Pryer.

OBITUARY

Mr. G. N. Robbins.—The death occurred at Eastbourne on 3rd May after a long illness of Mr. George Nifton Robbins. He was sixty-one. From 1931 to 1941 Mr. Robbins was a familiar figure in the refrigeration industry and became general sales manager of the International Refrigerator Co., Ltd. In 1941 he resigned to join the London Lamp Sales Division of the Edison Swan Electric Co., Ltd., with whom he was associated up to his enforced retirement through ill-health at the end of last year. Mr. Robbins served in the 1914-18 war and later became chief immigration officer for the Australian Government.



Left to right :—Mr. H. C. Weston, Mrs. J. G. Holmes, Prof. E. N. daC. Andrade, Mrs. L. J. Davies, Sir Gerald Kelly, Mr. L. J. Davies, Lady Kelly, Prof. Willis Jackson, Mrs. H. C. Weston, Mr. J. G. Holmes and Mrs. Willis Jackson

Illuminating Engineers' Dinner

THE annual dinner of the Illuminating Engineering Society was held at the Café Royal, London, W.1, on 9th May. The chair was taken by the president, Mr. L. J. Davies, and there was a company of some 200.

After the loyal toast Sir Gerald Kelly (president of the Royal Academy) proposed the toast of "The Illuminating Engineering Society" and in the course of his speech referred to the difficulty of lighting pictures in art galleries. He had visited every gallery that he could get into in Italy and France during the last six years but he had not seen a successful solution of that difficult problem. He asked the members of the Society how galleries should be lighted.

The President, responding to the toast, said that there should be a bond of sympathy between illuminating engineers and painters and sculptors. Their works of inward vision and outward craftsmanship could only be appreciated because of the light reflected from the surfaces they created and illuminating engineers were the craftsmen of light.

Then there were their relations with their brothers the electrical engineers. It was the electrical engineers who started them; the great scientist Faraday, whose

Sir Gerald Kelly, Prof. E. N. daC. Andrade and Mr. L. J. Davies

work was fundamental to electrical science and whom they very rightly held in the greatest reverence, recorded in the very first electrical entry in his famous diary an experiment on an electric arc lamp.

Referring to the architects and civil engineers, Mr. Davies asked if the architects ever reflected that a good lighting installation halved the cost of a building.

Mrs. J. G. Holmes, Mr. G. F. Cole, Mrs. V. W. Dale, Mr. V. W. Dale, Miss G. M. Jones, Dr. W. Geiss, Mrs. W. J. Jones, Mr. H. Chisholm Jack, Mr. W. J. Jones, Mrs. H. Chisholm Jack, Mr. R. O. Ackerley, Mrs. H. C. Weston and Mrs. R. O. Ackerley

At least it halved the cost per hour because it doubled the usage of the building. A fine structure costing many thousands of pounds might only be used in the daytime but if a few "paltry" thousands of pounds were spent on a lighting installation it could be used all night long and the cost of power was halved or very considerably reduced. He thought that architects should consult the illuminating engineers more than they did.

They sought in their work the co-operation of all the professions. They sought by their craftsmanship to bend the fundamental processes of physics to produce light sources of ever increasing efficiency. They talked learnedly about "contrast ratios" and "brightness patterns" but the user's eye was far more sensitive and complex than anything they could produce and knew nothing of angstroms, lumens and foot-lamberts. It had to pass a message to the brain and their job was to see that the message it sent was as acceptable as could be.

Dr. W. J. Wellwood Ferguson, M.B., Ch.B., proposing the toast of the guests and referring to the particular spheres of some of them, said that the illuminating engineer must be a bit of a physicist, something of an electrical engineer and a good deal of an artist.

Professor Willis Jackson, D.Sc., D.Phil., responding to the toast, said that those engaged in education depended enormously on the material help, and even more on the recognition and encouragement, which they received from their colleagues in industry. In electrical engineering the link between the two sides could never have been closer nor more friendly. It was recognized that those in the universities and technical colleges could deal with only part of the requirements involved in the production of a professional engineer, that industry had an equally important complementary part to play, and that the overall result would be the better if they co-operated closely throughout.

ANNUAL MEETING

THE annual general meeting of the I.E.S. was held in London on 8th May. The annual report of the Council for 1951 was presented by Mr. L. J. Davies, president, who pointed out that means would have to be found of raising additional income if the Society was to maintain its present activities in the face of rising costs.

Revision of the Articles of Association now entitled the Society to have five vice-presidents instead of three, each to serve for two years instead of three. There are now 212 members on the Register of Lighting Engineers, which has been in operation for nearly three years. Plans are being made for the third conference to be held at Eastbourne in May, 1952.

LIVERPOOL CENTRE LUNCHEON

NEARLY 140 people attended the recent annual luncheon of the Liverpool Centre (North Western Area) of the Illuminating Engineering Society. The guests included Mr. L. J. Davies (president of the Society) and Ald. J. J. Cleary (deputy Lord Mayor of Liverpool). Mr. T. D. Woods presided.

Mr. G. A. S. Nairn, M.B.E., chairman of Lever Bros. (Port Sunlight), Ltd., and a member of the Merseyside and North Wales Electricity Board, in an address outlined some of the influences of electrical development on industrial expansion and social conditions during the past century and touched on auto-mechanisms, saying that these already were producing such revolutionary developments in the control of productive processes that ultimately the relationship of man to the machine would become materially changed.

It was an easy matter, he said, to make out a good case for efficient industrial lighting on the grounds of greater quantity and quality of production alone, but the further factor to which more and more importance was being attached was the effect which lighting had on the employees. A gloomy atmosphere led to gloomy minds, whereas a bright and cheerful atmosphere could go a long way towards relieving monotony and solving our problems.

New Indian Laboratories

THE official *Indian Trade and Industry* reports the opening by the President (Dr. Rajendra Prasad) on 10th April of the new power and high-voltage engineering laboratories of the Indian Institute of Science, Bangalore. The President also laid the foundation stone of the civil and hydraulic engineering laboratory.

Professor M. S. Thacker, director of the Institute, said that the power engineering section would provide instruction to engineering graduates of Indian universities for two years, including a period of outside practical work, and short refresher courses for professional engineers. The first network analyser to be installed in India was a part of the equipment of the electrical laboratories. It would be made available to the Central and State Governments and various electricity authorities. The Bombay Government had made use of the equipment in connection with the Koyna Valley Scheme.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Non-Combustible Oils

WE have had a 12 kV 0·6 kVA sign transformer in use for some eight months. The transformer was filled with a mixture of p-p′-dichlor-diphenyl and tri- and tetra-chlor benzene (the water insoluble isomers only being used). This transformer has been in use for approximately 7½ hr a day for six days a week. It was sealed to prevent losses due to evaporation as it is outside and exposed to the sun to some extent. The transformer has given no trouble and when it was removed it was in as good a condition as when immersed.

Since reading the article on "Non-Combustible Oils" (*Electrical Review*, 6th April), we have carried out a series of tests on the 40–60 per cent mixture mentioned. We decomposed a quantity of this by electric arc, using carbon electrodes, and demonstrated the production of 49·29 per cent hydrochloric acid (estimated as silver chloride), a small volume of hydrogen and the presence of a small volume of acetylene (probably from the diphenyl derivative) and a volume of some gas of undefinable constitution. No carbon-dioxide or carbon-monoxide was present as our mixture was free from dissolved oxygen. We found it impossible to ignite, let alone explode samples of this gas with any mixture of air, even after it was freed from all traces of the aromatic chloride vapours by freezing.

From our observations if a flash-over was not too big, due to a non-recurrent surge, then it should not even be necessary to change the oil, as the flash occurs in an envelope of the vapour which quenches it more rapidly than normal oils. The stability of these compounds is very high and the percentage decomposition is very small indeed under normal conditions. The anhydrous hydrogen-chloride produced is in a practically non-ionized form and only very slowly attacks preferentially the iron case (if not protected) forming a film of ferrous-chloride and evolving hydrogen. In the case of an exceptionally big and prolonged flash it would probably be advisable to change the oil as the windings in any case would have to be inspected.

As regards toxicity of these substances we have had very little experience, except that since one occasion when our senior colleague was exposed to the vapour p-p′-dichlor-diphenyl he seemed to develop an allergic response and on contact with the solution, no vapour being discernible, the following symptoms developed:—irritation of the nose and respiratory tract, flushing and irritation of the skin, amounting sometimes to a dermatitis. We others, however, have suffered no apparent effect at all, despite more frequent exposures to the vapours. On account of the great chemical stability they probably pass through the system and are excreted unchanged in the urine. These substances, however, bear some resemblances in structure to substances which have found effective uses in pest control and insecticides; therefore it would be advisable to handle them with caution. We are at present investigating the properties of fluorene substituted derivatives; these have an even greater electrical and chemical stability than the chlorine derivatives, but are probably not available either commercially or cheaply.

We regret the delay in this communication, but the serious illness and sudden death of our senior colleague Mr. W. Stewart and the above tests prevented earlier communication.

Carlisle. J. E. HODGSON and A. V. SHECKLEY.

Human Values in Nationalized Electricity

FROM your "Appointments Vacant" section there is much to be learnt regarding the way in which the nationalized electricity supply industry is creating anomalies.

A glaring example is the B.E.A. advertise-

ment for an administrative officer (page 117, 27th April) for the Committee Section, Secretary's Office. It is stated that the successful candidate will be required to assist in organizing and supervising the work of the section and deputize for an assistant secretary in his absence. Applicants must have *some* practical experience of committee work in a large organization. "Knowledge of the electricity supply industry, although not essential, will be an advantage." The salary for the appointment (superannuable) will be within the provisional range £900–£1,250 per annum for a man and £800–£1,100 for a woman.

In addition to being surprised one should no doubt feel gratified for the concession that knowledge of the electricity industry will be an advantage. It is also interesting that applicants need only have *some* practical experience of committee work. A person from the jam industry might be very suitable; on the other hand it would appear to be just the job for a town hall committee clerk.

Now the anomaly is that the salary offered for this electrical job for which no special qualifications are required is up to £1,250 for a man and £1,100 for a woman (as likely as not it will go to someone in the thirties) whereas in the industry there are electrical men of wide experience of the industry and highly qualified, with service covering 25–30 years or more, who haven't the faintest chance of reaching £1,250 before they pass out. Such men who are engineers on the commercial, distribution or generating sides, who built the industry, are making sure that their sons do not follow in their footsteps—but no doubt the "administrators" will be able to run the whole of the electricity supply industry in the future.

Can the unhappiness in the industry, outside the ranks of the few fortunate ones and those from other walks of life who have got in at salaries they never even dreamed of, be a matter for wonderment?

The B.E.A. and the Area Boards appear to have not the remotest idea of correctly evaluating human service within the industry.

The trouble no doubt lies in the fact that in the present industry the secretarial and clerical side has become unduly inflated so that the mesmeric, high falutin' title of "administrative officer" has become attached to people who in saner times were known as clerks, and, irrespective of the anomalies thereby created, are given salaries to fit such high sounding titles.

London, N.W.2. FIAT JUSTITIA.

The "Gilbert" System

I AM particularly interested in the first paragraph in "Views on the News" by "Reflector" in your 2nd March issue (page 433). It seems to me that "Reflector's" comment that he does not know why the system of weekly meter readings and collections referred to is called the "Gilbert" system, calls for an answer from me as I am the designer of the system referred to and the inventor of the equipment used with it.

My system is being used very extensively throughout the country by national boards, both electricity and gas, and it was used before the institution of these boards by local government authorities and many leading gas and electricity companies.

"Reflector" will no doubt agree that the expense of the system is relative to the service which it gives and the economy which it effects, and in this respect I am quite sure we could satisfy him that the extensive use of the system is due to the economies which it effects; from that point of view it is not expensive, but very much the reverse.

London, N.W.9. ALFRED GILBERT,
Governing Director,
Alfred Gilbert & Sons, Ltd.

Restrictions on Private Plant

YOU report the statement made in Parliament by Mr. Noel-Baker, Minister of Fuel and Power, in answer to a question by Mr. Nabarro concerning the steps the Minister was taking to arrange for the removal of impediments and restrictions imposed by electricity supply authorities upon the installation of independent electrical generating plant ("Parliamentary News," 4th May).

The company with which I am connected has had, for many years previous to nationalization, agreements for each of its works with the local public supply departments for electric power at e.h.v. rates and the contracts included a printed clause prohibiting the use of any private generating plant except when the department's supply was not available. Existing plant was exempt from this clause by a hand-written

amendment. Upon nationalization the Electricity Boards asked for new contracts to be entered into and each contract contained the following clause:—

"The consumers shall not at any time when the supply is available at the point of supply employ any source of motive power or artificial lighting within or for the purposes of the premises other than the supply."

In view of this I feel that Mr. Noel-Baker's reply to Mr. Nabarro's question must have been made with his tongue in his cheek when he said that in 1948 the British Electricity Authority and the Area Boards decided to continue the policy of the supply industry to waive such conditions as prohibited the use of private generating plant. The inclusion of such a clause in current contracts is, to say the least, very misleading if it is actually the wish of the Authority at this unfortunate time of shortage of generating plant to make use of independent electrical generating equipment to help itself and the nation out of a tight corner.

Birmingham, 8. J. M. ADLINGTON,
Works Engineer.

NEXT WEEK'S EVENTS

Monday, 21st May

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Annual general meeting, to be followed by a film show.

St. Ermin's Hotel, London, S.W.1, 6.50 p.m. A.S.E.E. Central London Branch. "Suburban Railway Electrification."

Tuesday, 22nd May

BUXTON.—Institution of Incorporated Plant Engineers. Annual conference. (Continued until 24th May.)

LONDON.—85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. Parsons Memorial Lecture on "Sir Charles Parsons and Cavitation," by Prof. L. C. Burrill.

Wednesday, 23rd May

LEEDS.—At the Lighting Service Bureau, 24, Aire Street, 6 p.m. I.E.E. North Midland Education Discussion Circle. Discussion on "The Selection of Students for Courses," opened by Dr. R. Harper.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "Hydro-Electric Power Development in Scotland," by Sir Edward MacColl.

Waldorf Hotel, W.C.2, 6.30 for 7 p.m. Association of Consulting Engineers. Annual dinner.

Thursday, 24th May

LONDON.—School of Hygiene and Tropical Medicine, W.C.1, 6.30 p.m. Institution of Radio Engineers. "The Resistance Wire Strain Gauge in the Measurement of Physical Quantities," by J. L. Thompson.

Joint Engineering Conference

AS already announced, a Joint Engineering Conference is to be held at the Institutions of Civil, Mechanical and Electrical Engineers in London from Monday, 4th June to Friday, 15th June. The inception of this conference was stimulated by the project for the Festival of Britain and will be influenced by its objective to record the contributions to the advancement of civilization made by the engineers and scientists of this country during the past century. It is hoped, however, that distinguished foreign engineers will supplement the story in the discussions, thereby putting into proper perspective the contributions of their own countries.

Interdependence of all branches of engineering and the growing co-operation between the members of the three major Institutions in Great Britain will be emphasized at the conference, which will be open to all members of the three Institutions and to members of the institutions and societies participating in the conference of Commonwealth Engineering Institutions and the Conference of Engineering Societies of Western Europe and the U.S.A.

The technical sessions will be held in the mornings and some afternoons in the meeting halls of the three Institutions. Papers will be presented in abstract so that the major portion of each session can be devoted to discussion. Papers are of a most comprehensive and authoritative character and cover a wide diversity of subjects, including electric power, telecommunications, railways, sea transport, road transport, aviation, mining, electrical measurement and illumination.

In addition to the technical sessions a programme of visits to places of interest has been arranged and there will also be opportunities to visit the exhibitions of the Festival of Britain. Evening social functions are to be held during the first week of the conference, thereby providing an extremely well-balanced programme.

Further details of the conference, together with applications forms, are available from any of the three Institutions. There has already been a good response by members and it has been decided to fix Monday, 21st May, as the final date for the receipt of applications.

Electroplated Iron

Protective coatings of cadmium and zinc on iron and steel, excluding sheet, strip and wire, are the subject of B.S. 1706 which, although not specifying every factor that affects the performance of such coatings, will nevertheless serve as a basis for comparison. Copies of this new specification are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 2s 6d post free.

Conditions in Industry

E.T.U. Deliberations at Hastings

WHEN the Electrical Trades Union annual policy conference was continued at the Pier Pavilion, Hastings, last week, under the presidency of Mr. F. Foulkes, the delegates were addressed by the new Minister of Works, Mr. George Brown. Remarking upon the enormous civil and defence building programme which the Government was determined to maintain, he told the delegates that its achievement called for an increase in productivity in all sections of industry. That could be done by a better use of effort and by improving the "horse-power per man." Here the B.E.A. power station programme was a key matter. He believed that something approaching £100 million would be spent in the next year in bringing more capacity into commission. That was vital for the fulfilment of their industrial plans. The Minister also commented on the importance of electricity in the domestic sphere—people would not work well if home conditions were not satisfactory. It was likewise vital to the large rural population which had been badly treated in the past so far as electricity was concerned; there was a big backlog in that sphere.

The Minister went on to say that if he had come to his present job with any preconceived ideas at all, born from his own days as a trade union official, it was the feeling that they had allowed pride in craftsmanship to go too far back in the 'twenties and 'thirties. They should halt the playing down of status and standards and revive "a real sense of craftsmanship and pride in the job." He paid a tribute to the leadership of the E.T.U. for the vigour they were showing in the Apprenticeship and Training Council started last year. He had been told that over 500 apprentices had already been registered and he was impressed by the fact that so much had been done in such a short time.

Later the Minister was entertained to lunch at the Queen's Hotel, other guests including the Mayoress of Hastings.

Wages and Profits

Among the resolutions on wages debated by the delegates during the week was one which noted that increases obtained had been offset by the rapid rise in the cost of living. It deplored the deterioration of the living standard of the Union's members and urged the Executive to take all possible steps to satisfy their legitimate claims for higher wages at the expense of profits. Proposing the motion, Mr. Walter Stevens, the general secretary, recalled that at the Ramsgate conference last year he pointed out that if they took only a quarter of the surplus profits made by private enterprise, after deducting all dividends, depreciation allowances and taxation, and distributed the money among wage earners instead of

Mr. George Brown, Minister of Works, addressing the conference. On his left is Mr. F. Foulkes, general president, and on his right Mr. W. C. Stevens, general secretary of the E.T.U.

allowing it to be transferred as reserves, the workers' wages would be increased by 3s 2d in the £. At the 1950 profit levels the figure would be 3s 4½d and it was probably now 3s 7d.

Mr. P. H. Renwick (Newcastle) suggested that the Union was going in the wrong direction. Claims for increased wages were out of date; what was needed was some method of tackling the cost of living. He urged that the T.U.C. should work out a scheme for all the unions in the country, maintaining that a mad scramble for more pay would mean increased prices and might eventually lead to industrial chaos. He thought profits could be pooled and used to reduce living costs.

The resolution was carried.

Demands on Contractors

The conference also passed a resolution calling for an immediate application to the electrical contracting employers for a substantial increase in wages and for strenuous efforts to obtain the consolidation of the temporary hourly addition with the basic rate. The Executive was further called upon by other successful resolutions to consider negotiations with the N.F.E.A. and the E.C.A. of Scotland for a five-day week and also two weeks' holiday with pay.

Mr. R. G. McLennan (Executive Council) reported that within the last week the National Arbitration Tribunal had found that the Union's claim for two weeks' holiday with pay had not been established.

Other aspects of conditions in the contracting industry which were aired included sick pay, on which a resolution was passed seeking a scheme comparable with that existing in nationalized industries. On the other hand one asking for a substantially increased " country allowance " was defeated. One grievance voiced concerned the responsibility for the safe keeping of workers' tools which, as Mr. L. A. Hargrave (Beckenham) pointed out, may nowadays cost up to £20. The men, he said, had to work in all sorts of conditions and the employers should accept responsibility for tools left on the job. This view had the backing of the conference.

With the support of the Executive, the delegates carried a resolution expressing the opinion that it should be the aim of the E.T.U. that every boy apprenticed to the trade of electrician " in any industry " should be registered as an apprentice and should receive adequate and efficient training.

On the electricity supply side the conference passed a resolution asking the Executive to obtain for manual workers employed by the British Electricity Authority hours of work, rates of pay, holidays and pension schemes comparable with those of the clerical and administrative staffs of the Authority. The motion warned the B.E.A. that unless it faced up to the fact that pay was low when compared with private enterprise, it would be impossible to retain or recruit the best type of worker. Several delegates quoted cases of men giving up electrical work to take up better paid jobs as unskilled or semi-skilled men in motor production. One delegate, Mr. J. Hutton, complained that since vesting day the pay of clerical staffs had increased by 100 per cent, while that of manual workers had practically stood still.

Mr. J. Humphrey (Executive Council) said that they were hopeful of getting a contributory pensions scheme for manual workers employed by the B.E.A. not less favourable than that applicable to clerical workers.

It was further resolved that, having regard to the relatively small number of generation and distribution workers employed outside the electricity supply industry, the rates, shift allowances, enhanced payments, holidays and sick pay of the supply industry should be regarded as the appropriate rates for comparable grades outside, and the conference called upon the Executive Council to open up negotiations to implement this policy.

Electricity Management Criticized

A conference composite motion on the control and management of the B.E.A. noted that notwithstanding constant representations for a greater degree of workers' control and management of the industry, no progress in this direction had been made and in fact the B.E.A. and its Area Boards operated in a manner little different from those controlling various parts of the industry in pre-vesting days. Attention was called to wastages due to wrongful allocations of workers, material and money, and to the " general mismanagement of the local and higher authorities in the industry." The resolution called for direct representation of the workers at all levels of management and control and also demanded that

workers' committees and consumers' councils should have an effective voice in directing the industry's activities.

Mr. F. Walmsley (Manchester) said that where before nationalization a meter reader could tackle 100 meters a day, now because of " red tape and triplicating " he had difficulty in reading 30.

The resolution was carried.

A motion drawing attention to the growing crisis in the electricity supply industry evidenced by the continuing power cuts had a practical demonstration during the week when the conference venue itself was involved in a " cut " which put the microphones, clocks and lights out of action. The resolution deplored the restricted expenditure on the replacement of old plant and the installation of new generating plant. To meet this situation there needed to be a more vigorous policy at top level and large scale expenditure. An amendment added " that the money should be derived by reduction of excessive compensation payments to shareholders." This was passed after Mr. L. J. Gregory, of the Executive, had pointed out that the B.E.A. had made the strongest representations to the Government on the question of allocations for generating equipment. He added a warning that they must be careful that, with the cost of generating plant as high as it was to-day, they did not put future millstones round their necks.

A move to encourage a higher standard of workmanship by introducting compulsory registration of electrical operatives was opposed by the Executive and defeated; instead, the conference passed an amendment asking for legal enforcement of a higher standard of efficiency, components and materials.

The whole matter of wages was rather complicated by a resolution, carried against the advice of the Executive, asking for unified and standard rates and conditions for the whole of the electrical industry irrespective of geographical position.

Radio Electricians

Later, the opinion that radio members should receive wage rates appropriate to their skill and that those employed in the engineering industry should have considerably more than the skilled engineering rate was expressed by a resolution, passed by the conference, which sought a national wages agreement for the engineering section of the radio industry and further requested the Executive to do everything possible to establish equal rates for equal skill in the radio industry as a whole.

A delegate from the B.B.C.'s London studios proposed that in view of the " unsatisfactory attitude " of the Corporation towards recognition of the E.T.U. as representing its members employed by them, and the failure of previous attempts to reach a solution, the Union Executive should make new efforts to get satisfaction and should ask the T.U.C. to give full backing to a demand for increased pay and better conditions for its members at the B.B.C. The resolution was carried.

An immediate application for a substantial increase for all workers in the engineering and shipbuilding industries was recommended, dissatisfaction being expressed at the outcome of the £1 claim made in November, 1949, by the Confederation of Shipbuilding and Engineering Unions. Mr. McLennan (Executive) said that only a minority of workers got any advance last year and that had resulted in " guerilla warfare " in some areas. The limited gains obtained had been wiped out by the rising cost of living.

A proposal that the E.T.U. should withdraw from the Confederation of Shipbuilding and Engineering Unions was withdrawn. Mr. McLennan said that although there was some dissatisfaction with the affiliation, the Confederation negotiated on behalf of 3,000,000 workers and any break-away move would be a disaster.

The conference reaffirmed its objections to S.R. & O. 1305 on the grounds that it threatened the basis of trade union organization and asked the Union Executive to press for its repeal.

Among many general subjects discussed was that of housing, the opinion being expressed that the present programme was inadequate to meet the needs of the people.

During the conference gold badges were presented to Mr. C. Symes, who foundep the first branch of the E.T.U. in Cardiff in 1903; Mr. T. Gaynor, oldest member of the organization, who joined the old Telephone & Construction Union in 1894 and was chairman of the E.T.U. Birmingham Central Branch for many years; Mr. H. H. Morton, founder of the London Station Engineers No. 1 Branch and secretary for many years; and Mr. W. Lilburn, branch treasurer at Newcastle for 37 years.

Vehicle Lighting

Application of the Fluorescent Lamp to Transport

By J. J. FRENCH*

IN vehicles of low headroom fluorescent lighting has been found to satisfy the need for adequate illumination while it enables the designer to obtain a pleasing effect in the very limited space available. Much of the efficiency of a fluorescent installation lies in the type of circuit chosen and the equipment used.

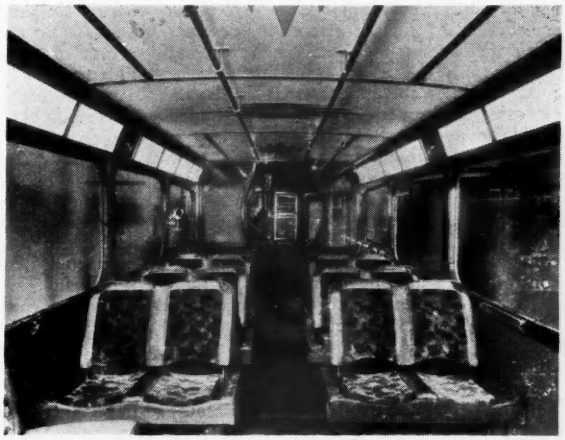
The amount of light required varies with the particular type of vehicle and also with the public service involved. For instance, in the case of road vehicles in a built-up area the average journey is of approximately five minutes' duration and mainly involves the provision of "movement lighting" of sufficient intensity to permit reading for short periods. As opposed to this, on suburban and country services the journey is rather longer so the need is for light of sufficient intensity, properly directed, to enable passengers to read in comparative comfort while still being of sufficiently low intensity to permit rapid "dark adaptation" when passengers leave in unlighted areas. For long-distance runs the basic requirements outlined are coupled with a certain amount of "luxury" or "prestige" lighting for holiday resorts, tourist centres, etc.

In all cases, however, weight and size of equipment are of paramount importance. The lower surface brightness and increased efficiency of the fluorescent lamp, as opposed to the ordinary tungsten filament lamp, reduce the need for diffusion and the number of lighting points necessary while still permitting even distribution of improved quality, but its use entails the employment of control gear and, in some cases, of conversion equipment, all resulting in additional weight.

Buses are probably an extreme example of this limitation. Height and width are restricted by regulations and the particular requirements of the coachwork virtually restrict the positioning of the lighting fittings to a small area directly above the window spaces where it is possible for them to be a source of visual discomfort.

The two ratings of lamp suitable for traction lighting are the 15 W and 20 W sizes. They require 110 V to allow an adequate margin for stabilization. So far as the lamps themselves are concerned the actual frequency of the supply is of no consequence. If the frequency is increased the lamp voltage-drop will decrease and

* Metropolitan-Vickers Electrical Co., Ltd.



The lower saloon of a modern tram, incorporating fully recessed fluorescent fittings each utilizing one 20 W warm white fluorescent lamp operated from a 600 V d.c. supply, the lamps being run four in series

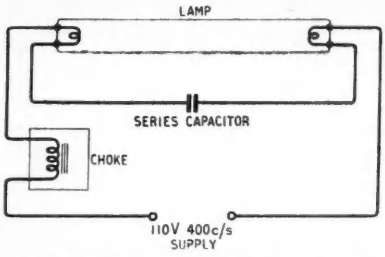


Fig. 1.—Simple resonant starting circuit consisting of a choke in series with the lamp and a capacitor across the cathodes

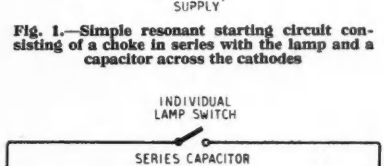


Fig. 2.—Two-winding choke for limiting preheating current

there will be a marked improvement of voltage and current wave-form, resulting in an improved apparent power factor of the lamp. The improvement in wave-form is important in so far as it permits the use of resonant starting without the destructive peak currents met with on the normal mains supply.

It would also appear that with an increase of frequency the input voltage could be decreased, but in practice it is preferred to maintain the voltage for adequate stabilization over a wider range of voltage variation. When conversion is necessary the input frequency can be chosen for optimum efficiency with a consequent reduction of weight and cost of control gear and conversion equipment.

In zero-frequency (d.c.) operation the lamp voltage-drop and efficiency are slightly higher, although the circuit efficiency is reduced by resistive ballast losses. Stroboscopic flicker is eliminated, but another factor is introduced. Because of the unidirectional flow of current a migration of the gaseous mercury filling towards the discharge cathode takes place and is apparent as a " dark end " effect at the opposite end of the lamp. This cataphoresis, which is not serious over short periods of time in the case of the lamps in question, can be eliminated by regular reversal of polarity by some form of automatic or manually operated reversing switch.

For road vehicles having 12/24 V batteries a motor-alternator or rotary invertor with an output large enough to supply either eighteen 20 W or twenty-three 15 W fluorescent lamps are common forms of conversion equipment. In view of the space and weight limitations and economic considerations, the inductor type of alternator, as opposed to the salient pole type, is preferred.

The particular machine used for several installations consists of a d.c. motor and a two-phase inductor alternator mounted in a common yoke and on a common shaft as a two-bearing machine. The set is totally enclosed, weighing only 35 lb; it operates direct from a 24 V battery at 4,800 r.p.m. and a.c. is generated at 110 V 400 c/s. It is virtually silent and was designed specifically for this application. The efficiency is of the order of 65 per cent, giving a total circuit efficiency of approximately 18 lumens/W of d.c. input.

Extensive experimental work has also been carried out with a vibrator invertor which, for efficiency as well as economy, seems very attractive, but fluorescent lamp circuits introduce commutation problems. Trials so far carried out have resulted in an output of some 150 W at 110 V 110 c/s. These tests have shown possibilities and it is hoped that more operational experience will result in fully satisfactory vibrators having a larger output.

In both these instances the frequency and wave-form are such that resonant starting can be employed. A simple resonant circuit would consist of a choke in series with a lamp which has a capacitor connected across the cathodes (Fig. 1). When first switched on a semi-resonant condition can be obtained so that the impedance of the capacitor closely approaches that of the choke. The current flowing through the circuit is dependent upon the difference between the two impedances and can be made large enough to preheat the lamp electrodes. The

voltage-drop produced by the current passing through the capacitor can be made higher than that of the mains and suitable for initiating the discharge through the lamp. When the arc is struck the capacitor is virtually short-circuited and the resonant condition destroyed.

The only difficulty with simple resonant starting of this nature is that the striking of the arc is likely to occur before the necessary preheating period, resulting in destructive cathode bombardment. This can be prevented by connecting the lamp circuits "direct on" to the machine so that they are run up with the alternator, or by using a small second winding in the choke which, in effect, short-circuits the lamp capacitor in the preheating stage, thus neutralizing the resonant condition, and, at the same time, increasing the reactance of the stabilizing choke to limit the current to the required value for preheating (Fig. 2). This preheating current is largely wattless so, with the lamp off, filament losses are only sufficient to keep the filaments at a black heat. On opening the individual lamp switch, the second winding is out of circuit, and the simple resonant circuit then functions. The preheating current passes into the lamp current, virtually without transients, in approximately 1/100th of a second and maintains a symmetrical wave-form.

For vehicles which obtain their motive power from rail tracks or overhead lines at 500/600 V it is usual for fluorescent lamps to be connected in series. Variations as great as 350/650 V may be encountered so that some form of barretter control is necessary, which can be obtained by using tungsten filament lamps in series with the fluorescent lamp circuits. The filament lamps themselves can be used for illuminating the destination indicators (Fig. 3).

Interruption of supply by line gaps, crossovers, etc., necessitates the use of a lamp-starting device of a rapid resetting nature; otherwise objectionable delay in the restriking of extinguished lamps may result. A starting device of this character (Fig. 4) depends upon resistance/capacity

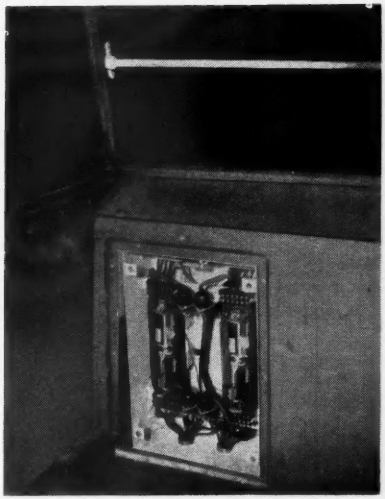
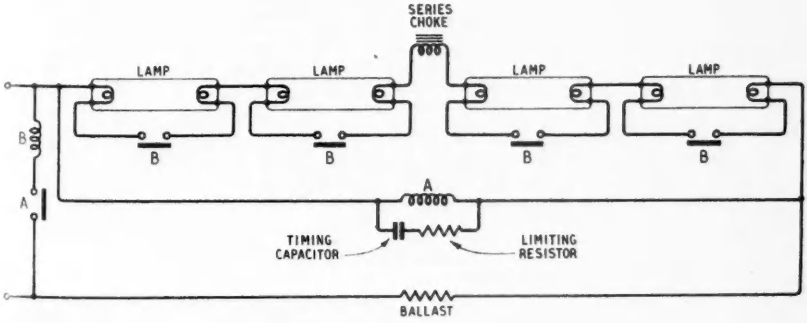


Fig. 3.—Control box adjacent to destination indicator panel housing magnetic starter switch assemblies for two four-lamp circuits

Fig. 4.—Restriking by resistance/capacity timing of electro-magnetic relays. A indicates a single contact relay coil and contact while B indicates multi-contact relay coil and contacts



The upper saloon of a modern tram, which has the same lighting circuit as the lower saloon. Surface mounted fittings are used because of the depth of metal skin available

timing of electro-magnetic relays. A single contact relay A is energized when the supply is switched on which, in turn, energizes the coil of relay B, closing the contacts of relay B to connect all the lamp cathodes in series with the ballast. The voltage across the relay coil A is maintained by the capacitor across it for a period sufficient only to ensure proper preheating of the cathodes. The correct values of capacity and resistance determine when relay A opens and B is de-energized, opening the cathode circuits together and providing even starting of the series lamps. Any interruption of the supply that is sufficient to cause extinction of the lamps results in an immediate repetition of the starting cycle.

The alternative method, using starter switches, cannot generally be employed with more than two fluorescent lamps in series owing to the difficulty experienced in matching the starter switches so as to obtain timed switch opening. A thermal starter switch (Fig. 5) having its two elements in series is connected in series with a glow starter switch. The latter is so designed that it will remain closed until the thermal starter switch has opened, causing the lamp to strike. The glow starter then opens and remains open; the thermal starter heater cools and its contacts revert to their normally-closed position and the system is ready for reoperation. Several interruptions of supply in quick succession will cause delay in restriking, however.

With varying vehicle design, the lighting fittings themselves show a definite trend. The tendency is for them to be self-contained, ceiling or corner mounted and, in the majority of cases, enclosed. Bare-lamp installations are occasionally encountered, but care must be taken to ensure that undesirable brightness contrast is avoided and to position lamps unobtrusively.

The more usual totally enclosed style is less liable to breakage and is easier to keep clean. The lamps can be surface mounted, semi-recessed, or totally recessed as in the lower saloon of a tram-car, the " in service " illumination being of the order of 12 to 15 lumens/sq ft. Other styles are integral

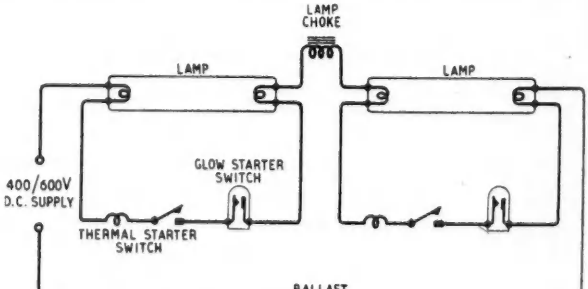


Fig. 5.—Matched starter switch method of re-striking two lamps

parts of the vehicle, arranged in a continuous line along the centre or, with due regard for seating positions, along the sides.

Buses and coaches vary considerably in details of construction and the lighting systems, in the same respect, differ considerably. Using the rotary machine previously referred to, an "in service" intensity of 10 lumens/sq ft can be obtained in a double deck installation of lighting units mounted behind the cornice plate. Hoopstick layout is a considerable factor and must be taken into account when considering the rating of lamps and type and spacing of fittings.

An example of bare lamp lighting on the underground trains of the London Transport Executive

For metal bodied trolley-buses low voltage lighting is normally specified and special dispensation is necessary from the Ministry of Transport for the installation of a.c. equipment at 110 V.

Boarding and alighting are possibly more frequent with trolley-buses than with most other forms of public service vehicle owing to their extensive use in built-up areas. Light on the platform and stairs must be adequate and glare-free and some provision should be made for a slight spill of light over the ground immediately below the platform.

The systems previously mentioned, with modifications, can be used for railway trains. It is usual, however, to install a motor-alternator operating either from the battery or high voltage track to provide 110 V at 400 c/s. A large installation of this nature, involving 70 alternators and almost 1,600 lighting units and control gear, is at present being supplied to the Netherlands Railways.

High frequency rotary convertors and special lightweight fittings have been designed for passenger aircraft and trial installations have been carried out.

New Power Stroboscope

At a recent Utilization Section meeting of the Institution of Electrical Engineers in London a new power stroboscope for high speed flash photography was described by Messrs. W. D. Chesterman, D. R. Glegg (both of the Royal Naval Scientific Service), G. P. Peck (Ernest Turner Electrical Instruments, Ltd.), and A. J. Meadowcroft (Siemens Electric Lamps and Supplies, Ltd.).

This instrument has been developed for use at picture repetition rates from 100 to 4,000 pictures a second, the duration of each flash being 5 μsec. The control circuit employs a hydrogen thyratron to trigger the tube discharge and the energy is supplied to the lamp at 12 kV. The 0·1 μF storage capacitor delivers 4 joules to the lamp. During the development of this instrument it was found that the light emission from a low-pressure xenon-filled tube persisted for a considerable time after the current had ceased to flow. This afterglow in xenon discharges is greatly reduced by an increase in gas pressure coupled with other changes in the physical design of the lamp.

The stroboscope described can be used for direct photography with a drum camera, or it can be synchronized with the optical compensation element of an image-compensated camera.

Progress in Western Australia

Expansion of Commission's Activities

THE operations of the Electricity Commission of Western Australia cover the electricity and gas undertakings at Perth, purchased from the City Council at the end of 1948, and a number of country undertakings including seven taken over in 1949–50 and six since June last. Besides necessitating considerable expansion of the Commission's organization, these acquisitions have involved a great deal of work in plant overhaul, meter testing, and the like, much of the equipment being inadequate and in need of rehabilitation.

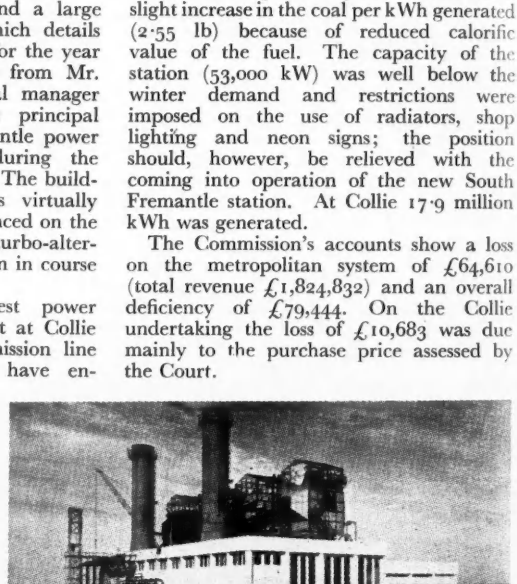
The Commission has in hand a large construction programme of which details are given in its annual report for the year ended 30th June last received from Mr. F. C. Edmondson, the general manager and chief engineer. On the principal scheme—the new South Fremantle power station—capital expenditure during the year amounted to £1,282,393. The building of the "A" station was virtually complete and work had commenced on the "B" station steelwork. Two turbo-alternators and four boilers were then in course of installation.

The Commission's south-west power station calls for additional plant at Collie and a large amount of transmission line construction, both of which have encountered difficulties through labour and material shortages. Three turbo-alternators were delivered and satisfactory progress was made on their erection, but the boilers and boiler house were seriously delayed by steel shortage. To overcome the lack of skilled labour for transmission line construction a linesmen's school was set up to train local men. A total of 158 miles of route has so far been surveyed and cleared.

In connection with a proposed change of frequency a census has been taken of some 50,000 consumers and much material has been obtained in readiness for the change-over.

Statistics of the year's working show that from the East Perth power station 214·9 million kWh was sent out, against 200·9 million in the previous year. There was a slight increase in the coal per kWh generated (2·55 lb) because of reduced calorific value of the fuel. The capacity of the station (53,000 kW) was well below the winter demand and restrictions were imposed on the use of radiators, shop lighting and neon signs; the position should, however, be relieved with the coming into operation of the new South Fremantle station. At Collie 17·9 million kWh was generated.

The Commission's accounts show a loss on the metropolitan system of £64,610 (total revenue £1,824,832) and an overall deficiency of £79,444. On the Collie undertaking the loss of £10,683 was due mainly to the purchase price assessed by the Court.



The new South Fremantle station, Western Australia

Commerce and Industry

European Purchasing Commission

Machine Tool Supplies Reduced

A EUROPEAN Purchasing Commission has been formed under the direction of the Minister of Supply to encourage the procurement in Europe of stores and equipment required for the United Kingdom defence programme. The objects are to help European countries of the North Atlantic Treaty Organization to develop their capacity to fulfil their own defence programmes and benefit their balance of payments and general economy; and to enable British manufacturing capacity to be used for essential home production and exports to a greater extent than the substantial rearmament programme would otherwise permit.

The Commission will advise manufacturers wishing to place sub-contracts in Europe. Examples of the type of equipment required include heavy and light engineering products; textiles; hardware; leather goods and items of ancillary equipment.

The chairman of the Commission is Sir Donald Perrott, K.B.E., and the deputy chairman is Captain K. J. G. Bartlett. They will be assisted by an advisory panel of experienced industrialists:—Sir Francis Brake (Standard Telephones & Cables), Mr. A. G. E. Briggs (Tube Investments, Ltd.), Mr. W. C. Puckey (Hoover, Ltd.), Mr. S. W. Rawson (John Brown & Co.), Sir Alan Saunders and Mr. E. W. Senior (Geo. Senior & Sons).

The Commission will have offices in a number of the main European countries. All inquiries on orders to be placed in Europe and on European potential should be addressed to the European Purchasing Commission, Ministry of Supply, Adelphi, John Adam Street, London, W.C.2.

Fewer Machine Tools

At a Press conference last week the Minister of Supply (Mr. G. R. Strauss) said that a cut of about 35 per cent in the deliveries of machine tools to home civilian users in the next eighteen months was likely to be needed to meet the defence programme. In order to ensure that this severe cut did the least harm to civil industry, he was about to set up regional panels to advise on methods of reducing or deferring the demand for tools. Representatives of these panels would visit civilian users' works to examine on the spot how pressing was their need to install machinery which they had on order, but which was now urgently needed for the defence programme. They would, for example, in consultation with the users, suggest substitution of types of machine more easily obtained; the more effective use of existing plant; and the deferment of delivery of machines against the company's replacement programme.

E.D.A. Films for Berlin Festival

Two E.D.A. films have been selected for inclusion in the programme at the Berlin Film Festival which takes place on 16th and 17th June. One is "Electro-Chemistry" (E.D.A. Educational Series) which won first prize in the scientific section of the Venice Festival last year. The other is "Fifty Acres," one of E.D.A.'s agricultural films, which shows how the introduction of electricity transformed a small farm. "Electro-Chemistry" was made by Merton Park Studios, Ltd., produced by Mr. F. A. Hoare and directed by Mr. J. Durst. "Fifty Acres" was made by Greenpark Productions, Ltd., produced by Mr. P. Fletcher and directed by Mr. P. Plaskitt.

Higher Irish Wages

Employees of the Irish Electricity Supply Board who are members of unions affiliated to the Irish Trade Union Congress have accepted an offer of a 4d an hour wage increase by a tribunal dealing with the matter.

Export of Iron and Steel Goods

The export of iron and steel goods under Open General Licence is now permitted only if the value exceeds the value of the iron or steel content, calculated at £30 per ton. This licence applies to iron and steel goods specified in Group 6 (2) of the First Schedule to the Export of Goods (Control) (Consolidation) Order, 1950. Under a similar previous licence, which is revoked, the value was £21 per ton.

Persian Telephone Contract

The General Electric Co., Ltd., announces that it has received a contract to manufacture and install four additional Strowger-type telephone exchanges for Persia. The exchanges will have a present total of 22,000 lines, with an ultimate capacity of 43,000 lines. In addition to the above, the G.E.C. is extending the existing line finder 6,000 line exchange in Teheran with a 2,400 line uniselector system.

Included in the contract for the four new exchanges is the laying of a complete underground network, with overground junction boxes, distribution cables and loaded cables to satellite exchanges. All supplies for this network are being provided by the Pirelli-General Cable Works, Ltd., an associate company of the G.E.C.

Tramcar Equipment for Leeds

Leeds City Transport Department has placed an order with the Metropolitan-Vickers Electrical Co., Ltd., covering a set of electrical equipment for a high-acceleration single-deck tramcar. The Metrovick equipment will include resiliently mounted motors on roller axle bearings, resilient gears, and automatic acceleration and braking equipment.

New Canadian Company

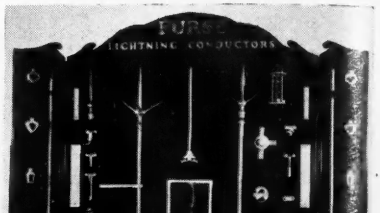
The David Brown Corporation, Ltd., formed in March, announces the establishment in Canada of a new company, David Brown (Canada), Ltd. Formation of this new enterprise, which will be based in Toronto, is primarily intended to supplement the existing agency coverage of the Corporation's gear-manufacturing group, headed by the parent company, David Brown & Sons (Huddersfield).

Prize for Welding Research

In 1948 the Council of the British Welding Research Association accepted an offer by the British Oxygen Co., Ltd., to provide a prize fund for a competition relating to welding for three years. For 1951 a single prize of £100 is offered for the best paper on research into welding or its application. Details can be obtained from the secretary of the Association at 29a, Park Crescent, London, W.1, to whom papers should be submitted by 31st December.

Lightning Conductor Display

A specially designed display board for lightning conductors and earthing equipment has been constructed by W. J. Furse & Co., Ltd., Traffic Street, Nottingham, which the



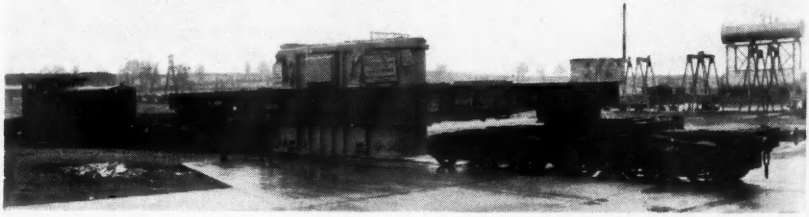
A display board of lightning conductor and earthing equipment

company is prepared to lend to any trader for exhibition display or similar publicity. The equipment includes various types of terminals, fittings, earth mats, rods, etc. The board is sprayed glossy black, and two wings are hinged and may be displayed flat with the board, or turned inwards at an angle. The overall size of the board is 5ft 9½in square. In the centre is a photograph of an actual lightning flash striking Blackpool Tower.

Diesel-Electric Loco Hauls Large Transformer

In the course of shunting duties at the B.T.H. Works, Rugby, a Ruston-B.T.H. 28 ton diesel-electric locomotive has had many opportunities during the past year of demonstrating its capabilities, particularly in connection with the transport of the large electric plant of all kinds which is made in these works. An interesting case occurred recently when a B.T.H. 75,000 kVA transformer was due to leave the works for the B.E.A. Staythorpe generating station. The transformer was mounted on a British

A Ruston-B.T.H. 28 ton diesel-electric shunting locomotive taking a 75,000 kVA transformer from the B.T.H. Rugby Works



Railways special vehicle, tare 77 tons, consisting of a heavy girder member carried on two pivots, each pivot being mounted on a platform carried by two 3-axled bogies, 24 wheels in all. The total load, including the shunter and a wagon of accessories, weighed approximately 250 tons. Along the first 300 yards of a one-in-fifty upward gradient, a steamer pulled and the shunter pushed; at the top of the bank, the steamer was uncoupled, and the shunter continued alone pushing the load along the level main avenue of the works.

London Electricians' Application

We reported in our 4th May issue that eight members of the Electrical Trades Union were seeking a declaration that the recent strike of electricians employed by the London Electricity Board was illegal and against the rules of the Union. They also asked for an injunction restraining the Union from expelling them or taking proceedings against them.

The matter again came before Mr. Justice Wynn Parry on 10th May when the applicants' counsel asked for a speedy trial. He alleged that the plaintiffs' position was very difficult. It was said that they had been threatened and one had been fined £20 by his branch and deprived of benefits for twelve months.

Counsel for the defendants said that they, too, desired a speedy trial and His Lordship agreed to the application.

Hot Cathode Dimming Installation

One of the first commercial examples of a dimming installation for hot cathode fluorescent lamps has been brought into use recently in the demonstration theatre at the new Bristol premises of the South-Western Electricity Board. The demonstration theatre is part of the Electricity Service Centre of the Bristol Sub-Area, which occupies the ground floor and basement of the new building, and the stage is equipped with facilities for cookery demonstrations.

Dimming control is applied to the lamps in four special twin-lamp fittings on the stage, and to one row of lamps in each of the twin rows concealed in cornices running across the auditorium, making a total of 35 hot cathode lamps controlled in this way. The apparatus, designed and supplied by the General Electric Co. Ltd., is similar to the equipment in the Chamber of the new House of Commons, and is of a type now becoming available for commercial installations.

New Polystyrene Plant

A new British polystyrene manufacturing plant has recently been put into full-scale operation at Partington, near Manchester. It is owned and operated by Styrene Products, Ltd., a company formed jointly by Petrochemicals, Ltd., and Erinoid, Ltd., and was designed and constructed by Petrocarbon, Ltd. Until recently, the manufacture of polystyrene was largely an American monopoly so that the production from this plant is a major asset to the British plastics industry. The polystyrene, which is marketed under the trade name "Erinoid," is supplied in the form of moulding powder, sheet and rod. Among its many applications are radio and television cabinets and components, refrigerator fittings, hearing aids and electrical apparatus generally. The plant covers an area of nearly 5 acres and production capacity is at least 5,000 to 6,000 tons of polystyrene per annum. The raw material for polystyrene is monomeric styrene; this will eventually be manufactured by Styrene Products, Ltd., from raw materials supplied from the adjacent petroleum chemicals plant of Petrochemicals, Ltd. In the meantime, imported monomer is being used. The products are being marketed both in the United Kingdom and overseas by Erinoid, Ltd.

Lunchtime Lectures

Another series of lunchtime lectures has been arranged by the Institute of Export for the benefit of students for its own examinations and for those of other professional bodies. The first of the series of eighteen meetings took place at the Merchants' Hall, The Baltic Exchange, St. Mary Axe, E.C.3, yesterday (Thursday) and the others will follow on Tuesdays and Thursdays from 1 p.m. to 2 p.m. The lecturers are Mr. V. Dover, Mr. H. E. Evitt and Mr. W. W. Syrett. Admission will be by ticket, available free to members and registered students of the Institute, and a limited number of tickets are available to non-members at 10s 6d for the full series. Application should be made to the general secretary, Institute of Export, 140, Cromwell Road, London, S.W.7.

Radio Equipment for Sweden

Following the completion of the new broadcasting stations at Hörby, Sundsvall and Gothenburg in Sweden, Standard Telephones & Cables, Ltd., have received a further £100,000 contract from the Swedish Broadcasting Administration for a new high power broadcasting station for Stockholm.

Traffic Signals During Load Shedding

Traffic light signals are often affected by electricity cuts or load shedding and the Ministry of Transport has advised local highway authorities of measures which can be taken to avoid dangers to road users when shedding takes place. In conjunction with signal installation manufacturers, the Ministry has devised apparatus which will within certain limits maintain the performance of signals during reductions in voltage. Such reductions may increase the length of time changes of the signals, particularly in the case of those constructed before 1938. The new apparatus will

help to counteract this difficulty where the reduction in voltage is not more than 15 per cent and will also improve the accuracy of signal timings under the lesser variations in voltage which occur even under normal conditions, so that its installation will be of permanent value. Three suggestions are made for precautions against signal failure through power cuts, particularly in open country on roads not subject to a speed limit. The suggestions are the erection of an approach direction sign fitted with reflectors at least 400–500ft from a junction; the installation of a line of reflecting road studs for at least 100ft from a junction; and a special warning sign "Traffic Signals Ahead" in "reflectorized" letters.

T.U.C. and Electricity Supply

The Labour Correspondent of *The Times*, reporting a meeting of the Electricity Sub-Committee of the National Production Advisory Council last week, says that the Trades Union Congress is urging co-ordination of the fuel industries. It considers that as competing services they cannot separately cope with peak difficulties in mid-winter. The T.U.C. also has doubts about the wisdom of creating sufficient generating capacity to meet peak loads as the cost of providing the extra power during comparatively short periods would be excessive.

70,000 kVA Transformer for Uskmouth

The first of six 70,000 kVA generator-transformers recently left the Witton Engineering Works of the General Electric Co., Ltd., for the new power station at Uskmouth, Mon. On reaching Witton station it was loaded on to a 120 ton crocodile truck for transport by rail to Uskmouth. As despatched, the transformer weighed 130 tons.

The Creda "Comet"

An example of the new Creda "Comet" cooker is now available for public inspection at the showrooms of the Simplex Electric Co., Ltd., 217–19, Tottenham Court Road, W.1, and, in connection with the Festival of Britain, further examples will be on display at the Kelvin Hall, Glasgow, and in the Travelling Exhibition which is touring the major towns throughout the country. So far all supplies have had to go overseas but a limited number of the cookers is now available for the home market.

New E.A.W. Branch

The South Dorset Branch of the E.A.W. was formed on 2nd May. The Mayoress of Weymouth, Mrs. H. A. Medlam, took the chair and became the Branch president. Councillor Mrs. C. Wootton, M.A., is the branch chairman and Mrs. M. B. Thompson the hon. treasurer. Speakers at the meeting were the Mayor of Weymouth; Mr. H. Nimmo, chairman of S.E.B.; Dame Caroline Haslett, E.A.W. Director; Mr. N. F. Gadsdon, Sub-Area manager; and Mr. T. Whitehouse, district manager. The Branch secretary is Miss Walker.

Attendance at B.I.F.

When the British Industries Fair closed last Friday 19,266 overseas buyers had visited the London and Birmingham sections, as compared with 19,005 last year. There was a fall in visiting home buyers from 113,013 to 99,455.

E.C.C. Exhibition Display

At a "Festival of Wolverhampton" exhibition being held from 4th to the 19th May as a part of the Festival of Britain, the Electric Construction Co., Ltd., has a stand on which are displayed photographs of its products dating back to the eighteen-nineties with examples of some of its most recent motors, switchgear and instruments.

Lighting Fittings Display

New "Mazda" fluorescent lamp fittings announced recently form the subject of the latest B.T.H. window display at Crown House, Aldwych, London. The fittings are intended for industrial and commercial applications and incorporate the new B.T.H. choke type MRJ. Various component parts are displayed with notes on constructional details and maintenance, simplification of the latter being an important feature.

Metric System Recommendations

In its report published last week (H.M. Stationery Office, Cmd. 8219, price 3s 6d) the Committee on Weights and Measures Legislation recommends that the metric system should be introduced in place of the existing system during the next twenty years. The Government, it is said, should take this step in consultation with the Commonwealth and United States Governments.

Marconi Veterans' Society

The fifteenth reunion and annual general meeting of the Marconi Veterans' Society was held on 5th May, 1951, at Caxton Hall, Westminster. The qualification for membership is 25 years' service with the Marconi companies, and of the total membership of 2,200 no less than 1,900 are still serving. At noon 160 veterans gathered to talk over old times, and at lunch Mr. H. E. Watterson presided, with Mr. W. I. McGhee as deputy. In support were Messrs. C. E. Rickard, H. M. Dowsett, C. S. Franklin and Andrew Gray, W. Davies, A. A. Kift, H. T. Round, G. E. Turnbull and W. M. Sampson, W. Platt, F. Beatson, A. J. Chesterton, Sir Ernest Fisk and C. C. Howe. Messrs. R. C. A. Kroes and L. F. Meyer represented the Dutch members. The chairman proposed the health of new

veterans, to which Mr. R. H. G. Cox replied, and Mr. F. H. Lansbury proposed the toast to absent friends. The health of the chairman, was proposed by Mr. R. Ferguson, general manager of the Marconi International Marine Communication Co., Ltd. Sir Ernest Fisk and Mr. R. C. A. Kroes also spoke. At the annual general meeting, Mr. W. I. McGhee was elected chairman for 1951-52, and Mr. A. A. Kift as deputy chairman.

A Century of British Progress

To celebrate the centenary of the Great Exhibition of 1851, of which it was the prime mover, the Royal Society of Arts invited a number of distinguished men to contribute a special series of six papers dealing with British achievement in the past one hundred years in the field of activity in which the Society is interested. These covered industry, commerce, science, engineering, design and education respectively, and they have now been published in book form, copies of which can be obtained at 3s 6d net from the Society at John Adam Street, Adelphi, London, W.C.2.

Buyers' Guide

A useful guide to buying and selling is available to electrical traders from Brown Brothers, Ltd., Browns Buildings, Great Eastern Street, London, E.C.2. This comprehensive and fully illustrated catalogue comprises nearly 300 pages devoted to general electrical appliances, wiring supplies and accessories, lighting fittings and a selection of hand and power tools. It is bound in stiff board covers and incorporates a system of indexing, which makes reference quick and simple.

Installation Charges in South Australia

The *Radio Electrical Weekly* (Sydney) reports that the Prices Branch in South Australia has issued a revised scale of labour charges which may be made by contractors working on electrical installations. The new scale includes increases (the first since 1948) in all rates, but the E.C.A. in South Australia does not consider them adequate to meet the steep rises in wages since the previous rates were fixed. The new scale of charges for a journeyman is 9s an hour for ordinary time, 12s for time and half and 15s for double time. No charge is to be made for overtime unless worked at the request of the person for whom the service is being supplied.

Trade Announcements

The **Edison Swan Electric Co., Ltd.**, has issued four attractive transparent window adhesives advertising separately :—" Royal Ediswan " lamps, " Silverlight " lamps, motor car bulbs and " Ediswan " car batteries. These are available free upon request to the nearest district office of the company.

Omega Lampworks, Ltd., Rodney Place, Merton Abbey, London, S.W.19, has introduced a new range of heavy duty traction lamps in wattages of 100, 150 and 200. These types are additional to their normal 40 and 60 W " rough service " lamps. They give a light output which is not substantially less than that of ordinary general service lamps

The Newcastle-upon-Tyne district office of the **British Thomson-Houston Co., Ltd.**, is now at 9, Higham Place, Newcastle-upon-Tyne, 1. The telephone number remains the same.

The **A.C.E.C.** has now made arrangements by which the Trevor Johnstone Co., Ltd., 169-174, Sloane Street, Knightsbridge, London, S.W.1, will be their exclusive distributors in England and Wales for Dictorel machines.

Catalogues and Lists

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—Comprehensive illustrated catalogue of electrical accessories.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Leaflet on general purpose and watertight handlamps.

Walsall Conduits, Ltd., Excelsior Works, West Bromwich.—Two comprehensive priced and illustrated catalogues, one on flameproof switchgear and equipment and the other on conduit fittings and accessories.

Wm. McGeoch & Co., Ltd., Warwick Works, 46, Coventry Road, Birmingham, 10.—Priced catalogue of weatherproof lighting fittings, leaflet on H.O. fuseboards in teak cases and another on ironclad switch assemblies.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 25th May :—

DYNALOG.—No. B683,661, Class 9. Electronic measuring instruments.—Foxboro-Yoxall, Ltd., Lombard Road, Morden Road, Merton, London, S.W.19.

VELVA-GLOW.—No. 696,459, Class 9.—Fluorescent lighting signs.—Nightingale Products (Blackburn), Ltd., 1J, Nightingale Street, Blackburn.

CATERPILLAR.—No. 695,682, Class 9. Scientific, surveying, weighing, measuring and checking (supervision) apparatus and instruments; electronic and electrical apparatus and instruments, all included in Class 9; wireless sets (complete), television sets (complete), fire extinguishing apparatus; and parts included in Class 9 of all the aforesaid goods.—Caterpillar Traction Co., San Leandro, California, U.S.A. Address for service, c/o Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

ACOUSTICON.—No. 692,779, Class 10. Electrical deaf-aid instruments and apparatus, and loud speakers, sound amplifiers, earphones, microphones and telephone instruments and apparatus, all being parts of such deaf aids.—General Acoustics, Ltd., 6-10, Douglas Street, London, S.W.1.

ELLISON.—No. B677,816, Class 11. Flame-proof lighting fittings for use in collieries and other places where explosive conditions exist.—George Ellison, Ltd., Wellhead Lane Perry Barr, Birmingham, 22.

I.E.E. Annual Report

Activities Maintained : Membership Increasing

THE formal annual general meeting of the Institution of Electrical Engineers took place in London yesterday, 17th May. The annual report of the Council for the 1950/51 session records that the Privy Council allowed changes in the by-laws, mainly concerning requirements for entry to various classes of membership and the number of ordinary members who may serve on the Council. Two whole pages of the report are devoted to educational matters.

Ship Wiring

A preliminary draft of an International Code for Electrical Installations in Ships has been completed by the I.E.E. Ships' Wiring Regulations Committee, which is the responsible British National Committee within the framework of the International Electro-technical Commission.

Under the provisions of the Wireless Telegraphy Act, 1949, the I.E.E. has nominated a panel of 45 persons from which the Postmaster-General has appointed two advisory committees to deal with the ignition systems of certain types of internal combustion engine and refrigeration apparatus with a view to abating the interference they cause with radio communication. Since the 12th edition of the Regulations for the Electrical Equipment of Buildings was published a year ago, 36,600 copies have been sold.

New members elected during the year numbered 2,431, a drop of 128, but 2,123 other applications were considered, mostly for transfer from one class to another, making a total of 4,554. The total membership of 36,558 represents an increase of 1,010 on the previous year. Members, Associate Members and Associates who reach the age of 60 and have 25 years' continuous membership may apply to retain their membership without further payment of subscription; 121 members took advantage of this rule during the year. A comparable rule for Companions (70 years of age) was recently introduced. Members, the Council and various committees held 1,162 meetings during the year. The average attendance at ordinary meetings rose to 267, while membership of the four specialized sections continues to grow. The Radio Section is the largest but the Supply Section attracted the largest average attendance at meetings.

Local centres and sub-centres arranged full programmes, while many outstandingly successful district meetings were held in outlying parts of the country for the benefit of members who otherwise would not have opportunities of hearing papers or taking part in discussions.

An I.E.E. Committee has been established, at the invitation of the B.E.A., the Area Boards and the B.E.A.M.A., to propose, consider suggestions and make arrangements for exhibitions dealing with the history and progress of electrical science and engineering. This committee is reviewing arrangements at the Science Museum and interim proposals have been made for re-staging and extending the electric power collection

Building Practice Codes

Thirteen electrical Codes of Practice for Buildings have been published in their final form and a further eleven have been reviewed. The preparation continues jointly with the B.S.I. of Codes relating to other matters. Two have been issued on the abatement of radio interference and one on flameproof equipment for industries other than coal mining. Two more have been circulated for comment: on street lighting (Part 1, traffic routes) and the abatement of radio interference caused by electric discharge lamps. Others are being drafted on earthing, overhead power lines, street lighting (Part 2, other routes), general aspects of radio interference suppression, and the selection and use of electronic valves.

The Minister of Fuel and Power is understood to be considering the promulgation of revised Overhead Line Regulations (EL.C.53, 1947, revised) based on the proposals of the joint B.S.I./I.E.E. Committee for a Code of Practice on the subject.

Scientific Instruments

Exhibition of British Equipment in Paris

THE latest British developments in instruments for research purposes have been on view to French scientists at an exhibition organized by the British Council which was opened in Paris on the 11th May by Professor E. N. da C. Andrade, F.R.S. (see *Electrical Review*, 16th March, 1951, p. 528) and closed yesterday (Thursday). It followed an exhibition of French scientific instruments held in London last year. During the exhibition the Holweck prize was presented to Sir Thomas Merton, F.R.S. This prize is awarded annually alternately to British and French physicists and commemorates M. Fernand Holweck, killed by the Gestapo for his activities in resisting the German occupation.

Among the industrial exhibits was the Finch electron diffraction camera for the study of the structure and chemical composition of surfaces. Other apparatus shown included a wide range of Geiger counter tubes, a dielectric test set, a counter chronometer for the measurement of short time intervals with the accuracy of a microsecond, an interferometer microscope, a vibrating reed electrometer of high stability and a spectrophotometer designed to measure the reflectance of a sample in several narrow bands of the spectrum, and a micromanipulator and a microdissector of recent design.

From the Universities

University exhibits from London included an X-ray unit developed at Birkbeck College with a new kind of electron-optical system associated with micro-diffraction cameras permitting very short exposure times. Applications of the R. & J. Beck reflecting microscope to the examination of biological materials under ultra-violet light were shown by King's College. An exhibit by the Royal Holloway College of the use of multiple-beam interferometry in the study of oscillating quartz crystals proved an attraction, and much interest was shown in the special sensitive micro-galvanometers and associated equipment for physiological research developed at University College. Bristol University provided a photographic exhibit illustrating the use of special photographic plates in the study of cosmic ray events. Recent experiments at the Pic-du-Midi on the decay of gamma-particles by means of a cloud chamber in conjunction with a strong magnetic field were illustrated by photographs from Manchester University.

Research Stations' Contributions

Among exhibits from research stations of the Department of Scientific and Industrial Research, the National Physical Laboratory provided a demonstration assembly of an electronic digital computor as well as several other exhibits; the automatic ionosphere recorder developed at the Radio Research Station was also demonstrated. Of the three Ministry of Supply research establishments taking part, the Atomic Energy Research Establishment at Harwell had four exhibits including a recently developed machine for the production of quartz fibres of any diameter from 1·5 to 300 microns; four instruments in which quartz fibres are used were displayed, the most interesting being two personal dosemeters—the wrist-watch electroscope and the fountain-pen electroscope. A millimetre wave spectrometer was lent by the Telecommunications Research Establishment, and five exhibits from the Royal Aircraft Establishment, Farnborough, included a counting accelerometer designed to respond exactly to sinusoidally varying accelerations at low frequency, with a negligible response at high frequency.

A number of new instrument techniques developed by the British Iron and Steel Research Association and by the British Electrical and Allied Industries Research Association were also shown. The latter displayed a vacuum torsion balance for the study of moisture in dielectric material with low moisture content and also a bridge designed on novel principles for the measurement of admittance of electrical insulation at 0·05–50 c/s.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Mr. Nigel Fisher asked the President of the Board of Trade if the export of independent electrical generating equipment to Russia had now ceased, and when the last was sent there.

Sir Hartley Shawcross said he was informed that Russian orders for the smaller types of generating sets referred to were completed before the end of 1950, and that no contracts had been placed since.

Gas and Electric Cooking

Mrs. Mann asked the Minister of Fuel and Power how far the researches made by his department established whether the use of gas or electricity for cooking was the more economical in the use of coal ; and what steps he was taking to encourage the more economical method.

Mr. Noel-Baker said that he was at present discussing these complex problems with the chairmen of the national boards concerned.

Westminster " Black-out "

Mr. Nabarro asked the Minister of Works questions about the causes of the black-out within the precincts of the Palace of Westminster on the morning of 30th April, 1951.

Mr. G. Brown said that electricity for the Palace of Westminster was supplied by the London Electricity Board. The black-out was the result of load shedding caused by the abnormally low temperature for the time of year. Limited lighting from batteries was provided for use in emergency and an emergency generator provided power for some other essential services. He was considering whether anything further could be done.

Power Cuts

Replying to Mr. Geoffrey Lloyd on 10th May, the Minister of Fuel and Power said that there had been power cuts of varying intensity in different parts of the country during the last few days. There had been three main causes. The first was the great increase in the demand for electricity; in the first four months of this year, the B.E.A. sent out 14 per cent more electricity than in the corresponding period of 1950. The second was the large proportion of generating capacity (28 per cent) which had been out of commission, mainly owing to the necessary summer overhaul and maintenance work and to temporary breakdown of plant. The third was the exceptionally cold weather of that week.

Mr. Lloyd referred to the belated concession for the introduction of stand-by plant into factories, and said that in 1947 the Ministry of Supply launched a £10 million scheme for providing stand-by generators for factories but owing to the failure of the Ministry of Fuel to make the necessary arrangements a surplus of those generators was exported to Russia.

Mr. Noel-Baker replied that it was found that oil was even more difficult to obtain than other forms of fuel.

Mr. Pickthorn asked how much generating capacity was out of use for recommissioning in an average May before the war and how much unsuitable coal had affected the question.

Mr. Noel-Baker said that on the last point, the answer was a very small amount indeed. On the first question the outage—the amount of capacity out of use—due to overhaul and breakdown was certainly greater than it was before the war. Maintenance was about the same, in proportion. It must be carried out between the months of April and September. Normally it did not cause power cuts and but for the exceptionally cold weather and the great increase in the demand for electricity would not have done so this year. The B.E.A. had to use a great deal of old plant which was liable to breakdown; the new plant was having heavy " teething troubles "; and owing to the great demand much of the plant had to be run continuously, which previously would not have been the case.

Answering further questions, Mr. Noel-Baker said that generating capacity increased last year by 765 MW, which was 30 per cent more than in the highest pre-war year. It would increase this year by somewhere between 1,005 and 1,100 MW. In the domestic demand the electric fire was certainly a very potent cause of power cuts, but the industrial demand was the demand which was increasing most.

Gold Coast Proposals

Mr. John Grimston asked the Secretary of State for the Colonies if he could yet make a statement on the proposal to establish a hydro-electric plant and an aluminium reduction works on the Volta river in the Gold Coast.

Mr. Dugdale said that Aluminum, Ltd., Montreal, and the British Aluminium Co. had made a joint examination of alternative projects for establishing aluminium smelters in North Borneo or the Gold Coast. The results were under consideration and further discussions with the companies and considerable further technical investigation in the Gold Coast would be necessary before a decision could be taken to proceed with either scheme.

SOUTH BANK DISPLAY

1.—Shot tower surmounted by 30ft diameter radio telescope aerial. 2.—The 200ft high "Skylon." 3.—Production belt showing switchgear assembly. 4.—Model of 60 MW Metrovick turbo-alternator. 5.—G.E.C. fluorescent lighting in the Royal Festival Hall. 6.—Reyrolle switchgear with "Perspex" covers to show operation. 7.—Crompton Parkinson tramcar bogey and control equipment. 8.—Ground floor of Power and Production Pavilion.

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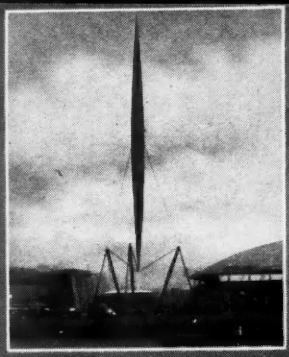

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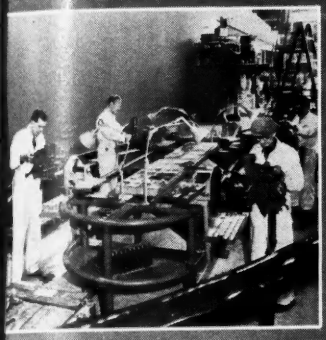

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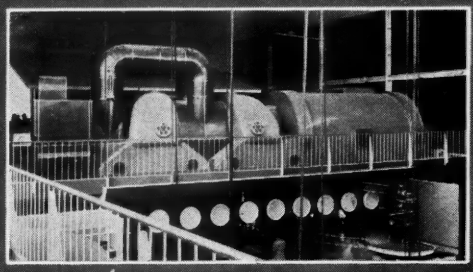

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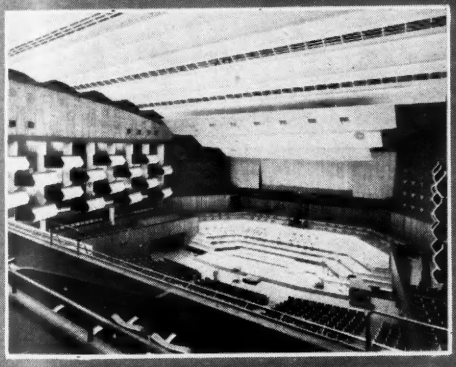

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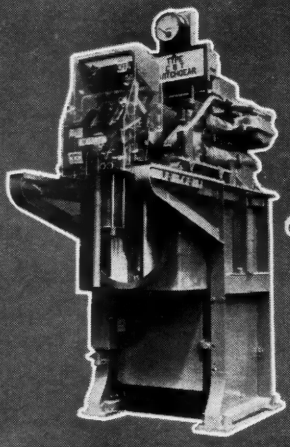

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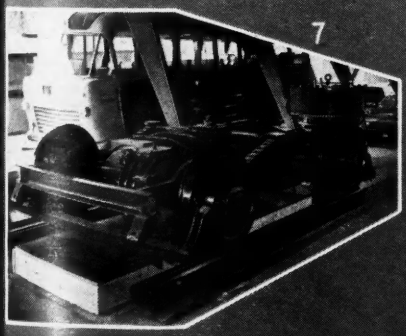

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FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Babcock & Wilcox, Ltd.—The annual meeting will be held on 31st May. In his circulated statement Mr. W. L. Fraser (chairman) says that the principal reason for the rise in trading profit is an unprecedented increase in output. Furthermore, the substantial extensions undertaken at the various works and the development of new processes, as well as changes in organization, have not only enhanced efficiency of production but have brought about this result even earlier than had been expected. The order book is still satisfactory, although with the increased productive capacity the rate of output now slightly exceeds the intake of orders. Export business has been on a large scale and efforts are being made to stimulate and develop these exports. The new research laboratories at Renfrew are now fully active and much effort is being devoted to research on combustion problems, and particularly to new methods of burning coals of inferior quality which now have to be accepted for power-generation purposes. The overseas subsidiary and associated companies are all operating satisfactorily. Extensions are proceeding at the works of the Australian company, and the erection of a modern works is in hand at Duncanville, near Vereeniging, for the South African company. The subsidiary companies at home are all working with excellent effect.

Enfield Cables, Ltd., reports a group profit of £381,941 for the past year, as compared with £456,504 for the preceding year. Taxation absorbs £210,536, and the amount attributable to the holding company is £171,405 (against £188,800). Reserves receive £16,961, and it is proposed to pay a final ordinary dividend of 3½ per cent, again making 7½ per cent for the year. The balance carried forward is £105,064 (against £61,558 brought in).

The National Electric Construction Co., Ltd., reports a profit for 1950 of £42,984, after providing £37,849 for United Kingdom taxation, as compared with £45,979 for 1949. The dividend for the year is unchanged at 10 per cent.

The Automatic Telephone & Electric Co., Ltd., reports a group profit for 1950 of £1,526,689, as compared with £1,192,899 for the preceding year, and after deducting £812,421 for taxation, there is a net profit of £714,268 (against £541,009). After making various allocations, it is proposed to pay a final ordinary dividend of 12 per cent (against 7 per cent and a cash bonus of 2½ per cent), making 15 per cent for the year, and a dividend for the year of 15 per cent on the deferred stock. For 1949 the total distribution on both ordinary and deferred stocks was 12½ per cent.

W. T. Henley's Telegraph Works Co., Ltd., reports group profits of the holding company for the year ended 31st December last, after all charges and provisions and taxation, of £685,559 (against £758,583 for 1949). Taxation amounted to £731,676 (£814,402) and the profit figure is arrived at after charging £23,145 (£105,000) for contract maintenance and crediting £16,508 (£14,513) profit on realization of investments; in 1949 there was also £51,698 from net receipts in respect of previous years. A balance at the credit of war damage claims of £78,328 (nil) is added to the 1950 profit. The final ordinary dividend of 10 per cent makes 15 per cent for the year and there is in addition again a cash bonus of 5 per cent. General reserve receives £220,000 (£255,000), replacement of buildings, plant and machinery £200,000 (same), fluctuation of prices and materials reserve £105,000 (£25,000) and staff pensions fund £69,000 (nil), and £953,477 is carried forward against £961,196 brought in.

The Metropolitan Electric Cable & Construction Co., Ltd., reports a trading profit for 1950 of £58,851, as compared with £123,900 for the preceding year, less directors' emoluments, depreciation, etc., totalling £11,305, plus investment revenue of £2,237, leaving £49,783. Taxation requires £25,850, and the net profit is £23,933 (against £61,997). The dividend for the year is maintained at 15 per cent by a final payment of 5 per cent and £129,934 is carried forward (against £120,951 brought in).

The Oriental Telephone & Electric Co., Ltd., reports a group profit for 1950, subject to final audit, after all charges, including taxation, of £103,303, as compared with £81,701 for 1949. The final dividend is unchanged at 12 per cent, again making 16 per cent for the year. Contingencies reserves receive £2,500, and tax equalization reserve £49,153. The balance carried forward by the parent com-

pany is £75,316 (against £74,121 brought in). The company reports that it has received notice from the Governor of Singapore that he will exercise his option under Clause 2 of the company's licence to acquire the undertaking in Singapore as at 31st December, 1954.

The Anglo-Portuguese Telephone Co., Ltd., reports a net profit for 1950 of £90,143, as compared with £61,032 for 1949. It is proposed to pay a final ordinary dividend of 5 per cent, maintaining the distribution for the year at 8 per cent, and to again pay a dividend of 8 per cent for the year on the "A" ordinary.

Murphy Radio, Ltd., reports a group profit, after all charges, including taxation, of £156,801 for 1950, as compared with £47,144 for 1949. The ordinary dividend for the year is 10 per cent, less tax (same).

Lightalloys, Ltd., has declared an interim dividend of 5 per cent (unchanged).

Newman Industries, Ltd., have declared a dividend of 6 per cent for the past year, against 10 per cent.

Worthington-Simpson, Ltd., are to pay a final dividend of 10 per cent, again making 20 per cent for the year but on capital increased by a 50 per cent share bonus.

New Companies

Speedy & Eynon (Electrical), Ltd.—Registered 2nd May. Capital £100. Electrical and mechanical engineers and contractors, etc. Directors: G. W. Bannister Scriven and Marguerite B. Scriven. Regd. office: 1, Gas Street, Birmingham, 1.

A. V. Milton & Co., Ltd.—Registered 2nd May. Capital £10,000. Electrical engineers and contractors, mechanical, manufacturing and repairing engineers, etc. Directors: A. V. Milton and Mrs. Edith M. Milton, both of 12, Bevington Hill, Liverpool, 3. Solicitors: Latin and Masheder, Liverpool.

Cable & Switchgear (Farnley) Installation, Ltd.—Registered 3rd May. Capital £1,000. General and electrical engineers and contractors, etc. Directors: W. J. Webb and Charlotte E. Fullstone. Secretary: Elsie H. Webb. Regd. office: 35, Hare Park Mount, Farnley, Leeds.

John Priestly, Ltd.—Registered 3rd April. Capital £1,000. Manufacturers, producers, installers and repairers of and dealers in electrical, wireless and television apparatus, etc. F. W. Watson is the first director. Secretary: Moira Watson. Regd. office: 164, High Street, Deritend, Birmingham.

Increases of Capital

Wolf Electric Tools (Holdings), Ltd.—Increased by £399,900, in 59,950 7 per cent cumulative preference shares of £1 and 1,359,800 ordinary shares of 5s each, beyond the registered capital of £100. The company was converted into a public company on 30th March.

Radcon Electrical Services, Ltd.—Increased by £5,000 in 8 per cent £1 cumulative preference shares, beyond the registered capital of £500.

Liquidations

John Priestly, Ltd.—We are informed that the recent appointment of liquidator of John Priestly, Ltd., was for technical reasons and a new company, with the same title, has been registered to carry on the business. The continuity of the business will be maintained and the financial position of the new company is in no way affected by the liquidation. The registration of the new company is recorded under "New Companies" on this page.

Electrical & Sound Services, Ltd.—Winding up voluntarily. Liquidators, Mr. P. W. Hort, 28, Baldwin Street, Bristol and A. H. Richards, 39-40, Fleet Street, Torquay.

Bankruptcies

S. G. Penrith, lately carrying on business at 14, Mount Pleasant, and 5, Mount Pleasant, Barrow-in-Furness, electrical contractor.—Order made 11th April last granting immediate discharge, conditional on debtor consenting to judgment for £100, payable by instalments of £5 a month.

A. W. Harber, carrying on business at 1, Kathleen Place, Redditch, Worcs, electrician.—Last day for receiving proofs for dividend 23rd May. Trustee, Mr. R. K. Clark, Somerset House, 37, Temple Street, Birmingham, official receiver.

L. Bloom, formerly carrying on business in partnership with another under the style of Bloom Bros., at 12, Duke Street St. James's, London, electrical engineers.—First and final dividend of 2s 6¾d in the £, payable 23rd May at Bankruptcy Buildings, Carey Street, London, W.C.2 (amended notice).

D. Bateman, 1, North Villiers Street, Leamington Spa, electrical contractor.—Receiving order made 8th May on a creditor's petition.

R. Kendall, 66 Sheen Road, Richmond, Surrey, electrical dealer.—First meeting 24th May at 3, Central Buildings, Matthew Parker Street, Westminster, S.W.1. Public examination 13th July at the Court House, Garrett Lane, S.W.18.

E. S. Raney, formerly carrying on business as an electrical engineer at Minstan Coldyhill Lane, Newly, Scarborough.—Last day for receipt of proofs for dividend 28th May. Trustee, Mr. G. W. Sisman, 6, The Parade, Northampton, Official Receiver.

STOCKS and SHARES

INCIDENCE of the Whitsun holidays brought about some slight lull in the activity which had been a feature of most of the markets round the House during the first fortnight of this month. There is, however, no lack of capital seeking employment, and no end to the rise in prices that this demand ensures. Since a week ago, there have been a good many price improvements, following upon those in each of the last two previous weeks, rises ranging from 7s 6d in Oriental Telephones, to 52s 6d, to 6d in a number of others. Siemens have been a good spot at 39s 6d and Chlorides at 70s, while other improvements include Lucas 42s 6d, Plessey 22s, Tube Investments 7 $\frac{1}{16}$, and Telegraph Condenser 46s 3d. On the other side of the sheet, Decca Records went back to 24s 6d, Johnson & Phillips to 63s 9d and De La Rue to 28s 9d.

Dividend News

Enfield Cables are maintaining the ordinary dividend for 1950 at the 7½ per cent paid since it was reduced from 12½ per cent in 1946. By the end of 1949, earnings had recovered from the equivalent of 10 per cent to 37½ per cent on the ordinary capital. On the strength of this five-fold cover, the optimists had been hoping for some move towards restoration of the former rate on this occasion. In the event, disappointment was reflected in a drop of 4s 9d in the price of the £1 ordinary shares to 34s, at which the return works out at a little under 4½ per cent. According to the preliminary statement, net profits, after tax, were some 9½ per cent lower on the year. They still provide a handsome margin over the amounts distributed. Market expectations were disappointed also when the London Electric Wire Co. declared its final dividend, making the total the same as last year's 10 per cent, although on larger capital this time. The ordinary shares dropped after the announcement to 48s 9d, showing a loss of 5s 9d on the week.

Automatic Telephone Results

Automatic Telephone rose 1s 6d to 72s upon declaration of an increase in the total distribution from 12½ per cent to 15 per cent, and in the year's net profit from £541,000 to £714,000. Anticipations had been pitched high, and were well satisfied with the results. At 72s, the ordinary shares give a yield of about 4 guineas per cent at the new rate of dividend, which improves on the unbroken line of 12½ per cent payments made since a year or two before the war. Deferred shares receive the same rate, and are quoted about 3s below the ordinary. These rank equally with the latter for dividend after each in turn has received 6 per cent, for which the ordinary have priority. These payments, added to dividends on the preference capital, together involve the distribution of less than one-fifth of the surplus available.

Hoover's "A" Shares

Queues formed in the Stock Exchange at the beginning of last week on the occasion of the marketing of Hoover 1s "A" ordinary shares. These were issued in 1947 to senior executives of the firm, by way of an incentive. A limited number of the 1,600,000 shares was made available initially at 20s, a price which was run up to about 26s within a few hours. The basis on which these shares participate with the ordinary is a complicated one, but the effect, in respect of the last financial year, was to produce a dividend of 208·4 per cent to correspond with the equivalent of 30 per cent paid on the present, and much larger, amount of ordinary capital. At the latest rate, the "A" shares show a yield of 8 per cent, as against less than 5 per cent on the ordinary, the difference being due mainly to the former's very high "gearing," and to their restricted capital rights. It is understood that the bulk of the "A" capital remains in the original hands.

Radio Shares

E. K. Cole 5s shares have come up this year from about 17s 6d to 23s which, although about 1s 6d below the recent best, is well above the highest quotation recorded in the three preceding years. In this period, they have been, at times, less than half the present price. Dividend and results for the period ended last March are due early in July. For the preceding year the company paid a 20 per cent dividend out of earnings equal to 77 per cent on the £202,000 ordinary capital. Since then the interim has been raised from 8 to 10 per cent. Radio shares in general continue to reflect a confident opinion of the outlook for the manufacturers in rearmament circumstances. Murphy Radio 5s shares have strengthened to 8s 6d since news of the 10 per cent dividend and the spectacular profits expansion. Ever Ready 5s shares hardened to 32s 6d ex dividend, after publication of the company's jubilee accounts.

Campbell & Isherwood

Dealings were due to start this week in the ordinary and 5 per cent preference shares of this company, which specializes in marine electrical equipment. The firm was incorporated in 1908 as a private company and became a public company in 1949. The ordinary shares were thought likely to start at about 47s 6d. The supply available for dealing purposes was not expected to be large.

ELECTRICITY SUPPLY

Generation Figures for April

Proposed Tariff for Off-Peak Loads

DURING the month of April, the total quantity of electricity generated by the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Co., was 5,015 million kWh. The increase compared with last year of 16·6 per cent was higher than usual, probably on account of the cold weather experienced during the month. According to the Ministry of Fuel and Power returns, the total installed capacity at B.E.A. power stations was 14,588 MW, which was 51 MW less than at the end of the previous month, although one new 60 MW Parsons turbo-alternator was brought into operation at Skelton Grange. This reduction was due to plant taken out of commission for overhaul. Including the North of Scotland, installed capacity aggregated 15,149 MW.

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water	Total*		
British Electricity Authority ..	2,844	7·0	4,847	41	4,900	4,622	14,588
North of Scotland	17	1·3	24	86	115	113	561
Total for April, 1951	2,861	8·3	4,871	127	5,015	4,735	15,149
Total for April, 1950	2,484	5·4	4,175	113	4,302	4,062	14,158
Increase, per cent	+15·2	+53·7	+16·7	+12·4	+16·6	+16·6	+7·0
Total for year to date (4 months) ..	12,503	37·9	21,236	540	21,850	20,661	
Total for corresponding 4 months of 1950	11,048	23·5	18,630	467	19,158	18,099	
Increase, per cent	+13·2	+61·3	+14·0	+15·6	+14·1	+14·2	

* The total figure includes generation by oil engines amounting to 11·7 million kWh and waste heat plants amounting to 5·6 million kWh in April, 1951.

Presentation to Millionth Consumer

Lord Citrine, chairman of the British Electricity Authority, visited a bungalow at Sway, a village near Lymington (Hants) last week to switch on a water heater presented to Mr. A. Tiller as the millionth consumer in the Southern Electricity Board's Area. He also made a personal gift of an electric iron to Mrs. Tiller. Lady Citrine, on the behalf of the secretary of B.E.A. (Mr. H. F. Carpenter), gave her an electric table lamp; there was also an electric kettle from the officers of the Southern Board.

Restrictions in Ireland

Announcing that it was unable to meet the abnormally high demand for electricity, the Irish Electricity Supply Board decided that as from 7th May the consumption of energy for space heating and water heating must not exceed half of the consumption in the corresponding period of last year. The consumption for all other purposes with the exception of industrial heating and power, would have to be kept at the same level as last year.

Coal and Electricity

Recently the Yorkshire Electricity Board invited the chairman, members and officials of the National Coal Board (North-Eastern Division) to inspect the Board's Barnbrough substation, near Doncaster, in view of its importance as a point of supply to collieries in the district. In turn the N.C.B. invited the Yorkshire Electricity Board to visit Barnbrough Colliery to inspect the surface workings, including the large winder. An interesting point is the close relationship which has developed between the campaigns for more coal and more electricity. In assisting the N.C.B. to carry out its programme of electrification of the mines, which in turn means more production of coal, the electricity supply industry is helping itself to ensure adequate supplies of fuel at the power stations.

Development in S.W. Scotland

The South West Scotland Electricity Board has approved a scheme to effect an immediate reinforcement of the network in the centre of Glasgow at a cost of £34,000. This will involve the laying of over a mile of underground cable, the provision of new switchgear and the installation of a 6 MVA transformer in the Board's substation at Midland Street, which will then be able to take some of the load from three surrounding substations. It is anticipated that the necessary work will be completed in

time for the 1951/52 winter load. The Board is also to spend £84,000 in giving a supply to several new housing schemes in the Area, including 768 new houses at Barmulloch and 628 at Newlands, Glasgow.

Shetland Extensions

The North of Scotland Hydro-Electric Board switched on a supply of electricity to the first of the outlying islands of the Shetland group on Saturday, 5th May. The island supplied is West Burra which is one of a group of three islands on the west side of the Shetland mainland. The provision of the supply to West Burra involved the laying of two submarine cables to form a connection between the mainland and the islands of Trondra and West Burra. The initial extension will supply approximately 100 homes on the island including 80 in the fishing village of Hamnavoe but the distribution scheme is to be extended to cover the remainder of the island and the islands of Trondra and East Burra.

On the Shetland mainland, h.v. lines have been erected as far south as Sumburgh Airport, 25 miles from Lerwick, and supplies are being given to Sandwick, 15 miles south of Lerwick. The Board has placed a contract for a new distribution line to supply the villages of Bixter and Aith about 20 miles west of Lerwick.

Harnessing Volcanic Steam

Engineers in Iceland are expected soon to "strike steam" in a further boring into the volcanic bed of steam 700ft beneath the blue rock at Krisuvik near the capital city of Reykjavik. Iceland lacks natural fuel supplies except for peat and, to provide power for the development of the island's herring by-product industry, engineers have been investigating the possibility of utilizing natural steam. Work began at Krisuvik eighteen months ago, and last summer a drill "struck steam" at a depth of 700ft. The jet that emanated from the 7in borehole rose 200ft into the air. So forceful was the escaping steam that it flung the one-ton boring machinery into the air. The power in this jet is estimated at 5,000 h.p. It is mostly steam, but has a small water-content which will have to be extracted before the steam can be used in turbines. Plans are being worked out for the harnessing of these initial jets and others for the provision of power on a national scale.

Volcanic steam in Iceland which it is proposed to utilize for electricity generation

Off-Peak Tariff Proposed

At a meeting of the North Western Electricity Consultative Council the chairman (Alderman Wright Robinson) referred to a suggestion that the North Western Electricity Board should introduce a special off-peak tariff involving the installation of time switches. The secretary (Mr. F. J. Marrow) said that between £50 and £80 million might be saved in the construction of power stations if the December peak could be flattened out. The Council agreed to recommend the proposal to the North Western Electricity Board.

Ban on Overhead Cables

A number of Peterhead ratepayers who have their houses wired for electricity are unable to get a supply switched on because the Town Council does not approve of an overhead wire crossing a street. When Baillie R. Forman pointed this out at Peterhead Town Council Streets and Lighting Committee, he urged that anyone within the burgh who could not get electricity by any other means should be permitted a supply by overhead line. One house he knew had been wired for electricity for almost four years, but until an overhead line was allowed, a supply could not be switched on. The Committee agreed that in future anyone wanting a supply which required overhead distribution should be allowed to make application to the Council and each case would be considered on its merits.

Street Lighting

STOKE NEWINGTON Highways and Sewers Committee has under consideration a scheme for the improvement of the lighting of certain roads in the northern part of the borough and the scheme has been submitted to the Ministry of Transport for approval. The estimate for the work is £17,704.

STOCKTON-ON-TEES Council's intention to spend £4,400 on the provision of electric street lighting on stage 1 of the Roseworth estate has been approved by the Ministry of Local Government and Planning.

Domestic Appliance Repair

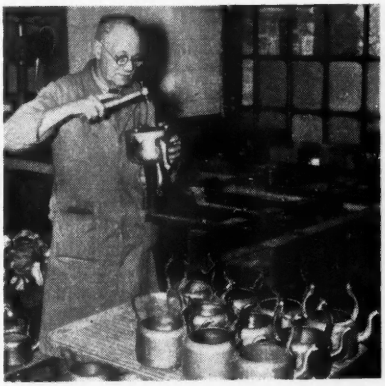
Keeping Existing Apparatus in Service

WITH the prospect of a very much reduced production of domestic electrical appliances resulting from the scarcity and the prohibition of the use of various raw materials, the maintenance and repair of existing apparatus has become of increased importance. The opening by Bulpitt & Sons, Ltd., at Sandpits, Birmingham, of a new service and spares department of 17,000 sq ft floor area is therefore opportune. Mr. T. N. Dunn, the manager of the department, hopes that the improved facilities will eventually permit the establishment of a twenty-four hour service for straightforward repairs of the company's apparatus, with notification by return of post in cases in which quotations are required.

The building is arranged on five floors. Appliances to be repaired are received either at a service counter on the ground floor, where supplies of spare parts are kept readily accessible, or, if in bulk, in a semi-basement. A lift brings the appliances to the appropriate floor where they are placed on conveyors ready for inspection. "Charge" and "no charge" jobs are separated, the latter proceeding immediately to the repair sections. Kettles and percolators are dealt with on the same floor, while the second floor is used for fires, irons, toasters, thermostats, etc. The third floor is reserved for special jobs.

Full electrical and water test facilities are furnished. A "Variac" regulator gives any desired voltage, while a special feature is the provision of a series of different sockets enabling apparatus to be tested with the customers' own plugs attached.

Top left: Repairing a coffee percolator. Top right: A portion of the kettle repair and test department. Below: Removing dents from kettle bodies



NEW BOOKS

Quartz Vibrators. By P. Vigoureux and C. F. Booth. Pp. 371; figs. 186; appendices; bibliography and index. H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 30s.

Although this book is based on the 1939 edition of " Quartz Oscillators and Resonators " by Dr. Vigoureux, the revisions and new matter included make it substantially a new work. Among these additions is a description of the methods for the bulk manufacture of quartz vibrators which is based on the experience of Mr. Booth in the radio laboratories of the Post Office and his close contacts with the British quartz industry during the war. The examination and selection of the raw quartz, bulk production of elements, their mounting, ageing and testing and the production plant required for this operation, are described in detail as are also the performance and applications of the vibrators to stable frequency generation, multi-channel telephony, radio transmission and ultrasonic submarine detection.

For a book of this size perhaps the authors have tried to cover too much ground, for in places there appears to be a lack of relevant detail, while in others unnecessary descriptive matter is included. This is, however, a minor criticism and the book, which is the most comprehensive and authoritative one on the subject to be published in this country, forms a useful addition to the literature on quartz crystals and will undoubtedly be of value to all who are concerned in their manufacture and use.—R.P.

Gmelins Handbuch der Anorganischen Chemie. Vol. 10, Part 2—Selenium. Pp. 414; figs. 113; index. Verlag Chemie, G.m.b.H.

The complete series of Gmelin comprises a comprehensive reference work of some 71 volumes, each volume being a monograph on a particular chemical element. The complete series is edited by a board led by Prof. Dr. E. Pietsch, mainly with an eye to use by the inorganic chemist. Gmelin is selectively written for research workers, being an adroit combination of text book and reference library. Abstracts are taken and very full references given to the origin of the abstract for the particular subject considered. This very factuality tends to make the reading rather turgid to a general reader.

Vol. 10, Part 2, deals particularly with the electrical properties of selenium. For research workers, physicists and engineers in the selenium rectifier and photo cell industry this book is invaluable since there is scarcely a single parameter or effect that is not fully analysed and listed.

A legitimate criticism of this 8th edition is the very full consideration of the almost obsolete photo-conductive type of selenium cell, compared with the scanty treatment of the modern barrier layer type. This type of work is regrettably absent in the English tongue and its style might well be simulated.

—R.C.L.

Eyes in Industry. By Dr. D. A. Campbell, Dr. W. J. B. Riddell and Sir Arthur Salusbury MacNalty. Pp. 234; figs. and index. Longmans, Green & Co., Ltd., 6 and 7, Clifford Street, London, W.1. Price 30s.

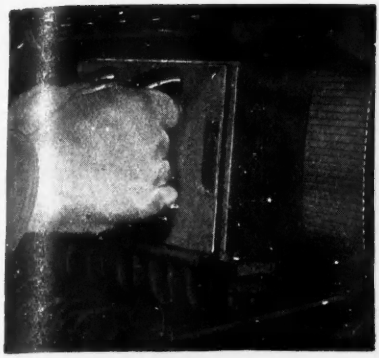
The electrical engineer, on taking up a book with this title, will naturally first look to see what consideration has been given to artificial lighting. He may be gratified to find that the distinguished contributors of the preface and introduction both stress the importance of this subject. But he will be disappointed with the chapter of nine pages that has been devoted solely to it, which is unworthy of the lead given in the formal preamble. This chapter should be rewritten before further copies of the book are sold. The opportunity might also be used to correct some statements and to reconsider other inexactitudes which are likely to be misleading.

Books Received

Electricity in the Home and on the Farm. Third edition. By F. B. Wright. Pp. 380; figs.; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 32s.

Diesel Fault Tracing, Maintenance and Repair. By Staton Abbey. Pp. 236; figs. 118; index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 15s.

Questions and Answers on Refrigeration. Second edition. By M. E. Anderson. Pp. 157; figs.; index. George Newnes & Sons, Ltd., Tower House, Southampton Street, London, W.C.2. Price 5s.



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1
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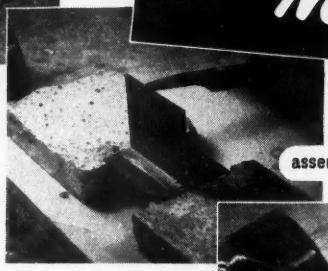
See how easy it is with
'Easy-flo No 2

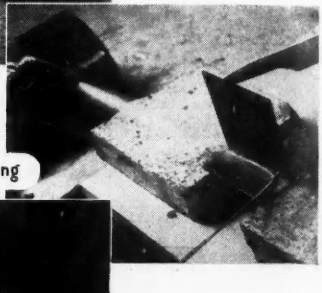


2
assembling

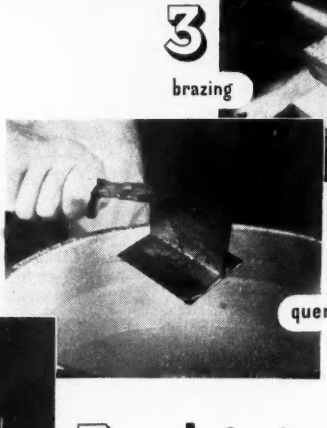
Five simple operations, and a neat, strong joint results — such is the simplicity in use of this versatile low temperature brazing alloy.

Suitable for a wide range of metals, it eliminates costly finishing operations, checks oxidation and distortion — and needs no skilled labour.

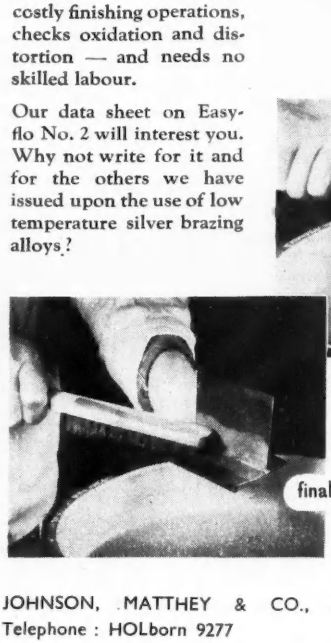
Our data sheet on Easy-flo No. 2 will interest you. Why not write for it and for the others we have issued upon the use of low temperature silver brazing alloys?



3
brazing



4
quenching



5
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LTB 14

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specifications (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

12415. Akt.-Ges. Brown, Boveri & Cie.—Devices for determining the contact time of periodically actuated contacts of switching devices. 25th April, 1946. (654624.)

13047. British Thomson-Houston Co., Ltd.—Magnetrons. 30th April, 1946. (654626.)

17238. Sperry Gyroscope Co., Inc.—Scanning systems utilizing radio energy. 6th June, 1946. (654628.)

1947

2257. Sterling Varnish Co.—Method of providing electrical articles with insulating varnish. 24th January, 1947. (654637.)

3710. Standard Telephones & Cables, Ltd., and Hartley, G. C.—Electric signalling systems. 6th February, 1948. (654639.)

8347. British Thomson-Houston Co., Ltd.—High-frequency electric discharge devices. 27th March, 1947. (654644.)

9722. Holoplast, Ltd., and Gonda, D.—Manufacture of thermo-set plastic laminates, and the products of such manufacture. 9th April, 1948. (Cognate application 9130, 31st March, 1948.) (654645.)

10571. Raytheon Manufacturing Co.—Electron-discharge devices. 18th April, 1947. (654648.)

10380. Hitchcox, G. I.—Electrical devices for measuring small intervals of time. 19th April, 1948. (654649.)

11693. British Thomson-Houston Co., Ltd.—Fluorescent lamps. 1st May, 1947. (654650.)

18887. Merck & Co., Inc.—Electrolytic oxidation process. 16th July, 1947. (654655.)

25059. British Thomson-Houston Co., Ltd.—Transmission cells for ultra high-frequency devices and systems. 12th September, 1947. (654668.)

29411. British Thomson-Houston Co., Ltd.—Methods of producing a smooth film on a granular fluorescent screen. 4th November, 1947. (654673.)

1948

2705. British Thomson-Houston Co., Ltd.—Synchronous electric motor control systems. 29th January, 1948. (654763.)

3646. Wiegand Co., E. L.—Electric heating elements and process of making same. 7th February, 1948. (654765.)

5934. Director of the Office of Technical Services, Department of Commerce.—Generating oscillations. 27th February, 1948. (654684.)

5940. Director of the Office of Technical Services, Department of Commerce.—Wide frequency-range magnetic recording and reproducing system. 27th February, 1948. (654685.)

9099. Young, S. G.—Snap-action electric switches. 29th April, 1949. (654693.)

9130. See 9722/47.

9705. Smith A. W.—Type of clock face to ring electric bells, work electric remote control switches, control radio sets and the like. 25th March, 1949. (Addition to 606501.) (654769.)

9944. Standard Telephones & Cables, Ltd., Hargreaves, T. F. S., and Gould, W. F.—Electric signalling systems. 8th April, 1949. (654674.)

10770. Hitchcox, G. I.—Electrical devices for measuring small intervals of time. 19th April, 1948. (Divided out of 654649.) (654675.)

13797. Philips Electrical, Ltd.—Television receivers. 21st May, 1948. (654699.)

13850. Watson, Ltd., and Wilson, A. R.—Electrically propelled articulated vehicles. 4th May, 1949. (654773.)

14175. Pye, Ltd., Cope, J. E., Lord, A. V., and Bennett, A. J.—Apparatus for generating wide electric pulses from a pulse train of narrow pulses. 22nd June, 1949. (654774.)

14776. Mallory Metallurgical Products, Ltd.—Resistance welding apparatus. 28th May, 1948. (654700.)

14797. British Thomson-Houston Co., Ltd.—Iron alloys. 1st June, 1948. (654776.)

14802. Philco Corporation.—Electric pushbutton switches. 1st June, 1948. (654777.)

15174. Dixon, M. G. (Robertshaw-Fulton Controls Co.).—Electric control systems for fuel burners. 4th June, 1948. (654703.)

16261. Colborne, R. H.—Manufacture of cathode-ray tubes. 10th June, 1949. (654705.)

17911. Carry R. H. J.—Radio aerials for aircraft. 2nd July, 1949. (654707.)

19761/3. British Thomson-Houston Co., Ltd.—Dynamo-electric machines and slot wedge members therefor. 23rd July, 1948. (654710/2.)

21509. Wellstead, L. G.—Methods of making glass bases for electron-discharge and other devices. 5th August, 1949. (654724.)

22547. Ellis, L. S. E. (Robertshaw-Fulton Controls Co.).—Electric safety control systems for fuel burners. 26th August, 1948. (Addition to 610145.) (654729.)

22894. Pye, Ltd., and Holland, E. O.—Electronic counting circuit. 26th August, 1949. (654731.)

23747. Radio Corporation of America.—Improvements in reflectors for radiant energy. 9th September, 1948. (654734.)

25699. British Mechanical Productions, Ltd., and Deakin, S. T.—Electric socket contact elements. 28th September, 1948. (654742.)

26831. Standard Telephones and Cables, Ltd., and Leng, C. W.—Methods of applying terminals to cracked carbon resistors. 15th October, 1948. (654745.)

28488. Cole, Ltd., E. K., and Burnard, C. L.—Short wave radio receivers. 1st November, 1949. (654796.)

28814. British Thomson-Houston Co., Ltd.—Dielectric heating apparatus. 5th November, 1948. (654752.)

29455. Williamson, S.—Electric motor control systems. 12th November, 1949. (654756.)

29645. General Electric Co., Ltd., and Munns, J. G. W.—Electrical oscillation generators. 15th November, 1949. (654758.)

29904. British Telecommunications Research, Ltd., and Bell, D. A.—Mechanical scanning devices for picture telegraphy and like purposes. 1st November, 1949. (654759.)

30076. Woroncow, A., and Buckingham, J.—High-frequency transformers for e.h.t. power packs. 16th December, 1949. (654805.)

30355. Philips Electrical, Ltd.—Tubular X-ray diaphragms. 23rd November, 1948. (654807.)

30574. Pye, Ltd., and Court, P. R. J.—A.c./d.c. power supply arrangements particularly for television receivers. 7th June, 1949. (654810.)

32126. Miller, F. J., and Miller, N. V.—Electric lighting dynamos for pedal cycles and like road vehicles. 13th December, 1949. (654818.)

32449. Sarnoff, S. J.—Artificial respiration by electronic stimulation. 15th December, 1948. (654823.)

32699. Standard Telephones & Cables, Ltd.—Pulsed oscillator. 17th December, 1948. (654827.)

32701. Clave, G., Lyonnet, A., and Boiteux, M.—D.c. generator particularly for electrical measuring instruments. 17th December, 1948. (654828.)

32771. Hutchings, E. L.—Switch-controlling devices for motor operated gramophone record playing units. 19th December, 1949. (654829.)

32856. Philips Electrical, Ltd.—Communication apparatus. 20th December, 1948. (654830.)

1949

11513/4. Young, S. G.—Snap-action electric switches. 29th April, 1949. (Divided out of 654693.) (654715/6.)

1950

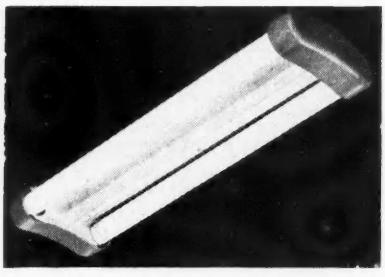
13599. Mallory Metallurgical Products, Ltd.—Resistance welding apparatus. 28th May, 1948. (Divided out of 654700.) (654719.)

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Fluorescent Fitting

THE latest "Atlas" fluorescent lighting fitting to be introduced by THORN ELECTRICAL INDUSTRIES, LTD., 105–109, Judd Street, London, W.1, houses two 2ft 20 W lamps and



"Atlas" twin 2ft 20 W fluorescent fitting

may be either mounted on the ceiling or suspended by means of rods. The overall length of this neat little fitting is only 25in, but the average light output throughout the 3,500 hours' life of the lamps is about 1,000–1,200 lumens.

Automatic Starter

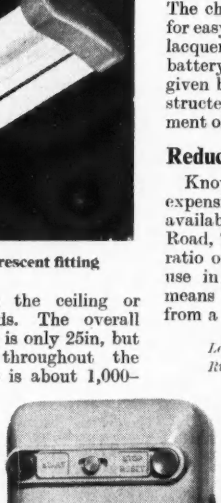
A newcomer to the range of switches manufactured by the ELECTRICAL APPARATUS CO., LTD., St. Albans, Herts, is the type F2 "Autoswitch" which is designed for the direct switching of motors up to 7·5 h.p. on 340/550 V mains and 3 h.p. on 200/250 V supplies. A feature of this unit is that it embodies positive protection against single-phasing independent of the overload setting.

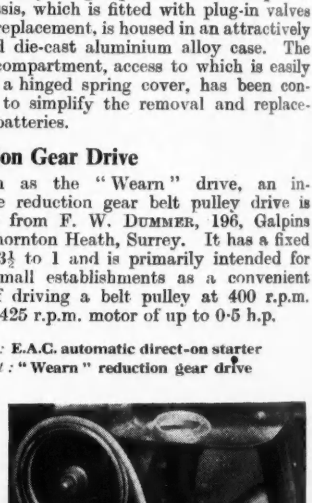
Powerful Hearing Aid

The K30 hearing aid made by AMPLIVOX, LTD., 2, Bentinck Street, London, W.1, has a maximum gain of 57 db which can be increased by a further 7 db by using a special low tone earphone. The chassis, which is fitted with plug-in valves for easy replacement, is housed in an attractively lacquered die-cast aluminium alloy case. The battery compartment, access to which is easily given by a hinged spring cover, has been constructed to simplify the removal and replacement of batteries.

Reduction Gear Drive

Known as the "Wearn" drive, an inexpensive reduction gear belt pulley drive is available from F. W. DUMMER, 196, Galpins Road, Thornton Heath, Surrey. It has a fixed ratio of 3½ to 1 and is primarily intended for use in small establishments as a convenient means of driving a belt pulley at 400 r.p.m. from a 1,425 r.p.m. motor of up to 0·5 h.p.





Left: **E.A.C. automatic direct-on starter**
Right: **"Wearn" reduction gear drive**

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia.—BRISBANE.—11th July. State Electricity Commission of Queensland. Two 1,000 kVA oil-immersed and natural cooled type distribution transformers. (C.R.E. (I.B.) 59998/51. Ten/2403.)*

SYDNEY.—12th July. Sydney County Council. 66 kV arc suppression coil. (C.R.E. (I.B.) 60207/51. Ten/2430.)*

Cambridge.—City Council. Street lighting equipment. (See this issue.)

Cuckfield (Sussex).—21st May. U.D.C. Installation of electric lighting and power circuits in 74 council houses, Haywards Heath and Cuckfield; housing manager, Maxwelton, Boltro Road, Haywards Heath.

Durham.—4th June. County Council. Supply of electrical laboratory equipment, workshop tools, and measuring tools and instruments, to the Stockton-on-Tees Technical College. A. A. Denholm, director of education, Shire Hall.

Farnborough (Hants).—30th May. U.D.C. Supply of street lighting equipment. (See 11th May issue.)

French West Africa.—DAKAR.—31st May. Public Works Department. Four transformers for Bobo-Dioulasso electricity works. (C.R.E. (I.B.) 60025/51. Ten/2399.)*

India.—MADRAS.—30th May. Stores Purchase Committee, Government of Mysore. Fuse cut-outs for 5 kV and 15 kV circuits. (C.R.E. (I.B.) 59853/51. Ten/2401.)*

New Zealand.—WELLINGTON.—17th July. State Hydro-Electric Department. Supply of eight 110 kV 1,500 MVA, and ten 110 kV 1,000 MVA circuit breakers. (C.R.E. (I.B.) 60578/51. Ten/2442.)*

24th May. Post and Telegraph Department. Supply of d.c. ammeters. (C.R.E. (I.B.) 60591/51. Ten/2439.)*

Northampton.—30th May. R.D.C. Electrical installations in 96 houses; R. J. Miller, architect, 1, Cheyne Walk.

St. Neots.—16th June. U.D.C. Street lighting equipment. (See 11th May issue.)

South Africa.—JOHANNESBURG.—14th June. South African Railways. Radio beacon equipment. (C.R.E. (I.B.) 59848/51. Ten/2435.)*

Sowerby Bridge.—28th May. U.D.C. Street lighting installation. (See this issue.)

Stanley (Co. Durham).—25th May. U.D.C. Street lighting equipment. (See this issue.)

Syria.—DAMASCUS.—Damascus Electricity & Tramway Co. Construction and equipment of a 7,000 kW hydro-electric power station on the River Barada. (C.R.E. (I.B.) 60540/51. Ten/2444.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Durham.—County Council. Electrical installation at Winlaton Hostel (£928).—J. R. Lyons, Newcastle-on-Tyne.

Ilford.—Borough Council. Recommended. Renewal of the electrical installation at Newbury Park School (£2,549).—B. Winters & Son, Ltd.

Manchester.—Corporation Housing Committee. Electrical installations in 58 houses.—F. W. Cole & Son. Electrical installations in 60 flats at Naylor Street, Miles Platting.—H. C. Taylor & Co.

Northumberland.—County Council. Electrical appliances for a proposed new staff canteen (£221).—Hobart Manufacturing Co., Ltd. Electrical work at the canteen (£342).—Gray Brothers, Newcastle.

Rotherham.—Highways Committee. Recommended. Equipment for ninety-five street lamps in connection with lighting of Broom Lane, Broom Valley Road and Brunswick Road (£3,571).—G.E.C.

Sheffield.—Corporation Housing Committee. Electrical installations in 104 houses on Littledale estate (£2,203).—A. Holmes. Electrical installations in 22 houses at Manor Park, Woodthorpe and Basegreen; electrical installations in 182 houses and 32 flats on the Bowden Houstead estate (£4,276).—Hobson & Scott, Ltd.

West Hartlepool.—Education Committee. Electrical installation at the Rift House County Primary School.—B.S.C. Electric, Ltd., Leeds.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne.—College of further education for Lancs E.C. (£116,595); Moston Brick & Building Co., Ltd., Collyhurst Lane, Moston, Manchester.

Billingham-on-Tees.—Light chemical factory for Thomas Swan & Co., Ltd., Rugeley, Staffordshire.

Birmingham.—Houses (25) for firemen, Brays Road, Kitwell Farm and Shard End estates; city engineer.

Blackburn.—Houses, Clarendon Road (20)

and Green Lane (58); John Laing & Son, Ltd., Dalston Road, Carlisle.

Bournemouth.—Dairy (£260,000); Malmesbury & Parsons Dairies, Ltd., Palmerston Road, Boscombe.

Bromley.—Dwellings (139), second stage of Hayes Place site; Dalgleish and Pullen, architects, 17, Fitzhardinge Street, W.1.

Chester-le-Street.—Aged people's houses in villages for the R.D.C.; F. Bowman, housing architect.

Cleethorpes.—Houses (44), Davenport Drive site; Wilkinson & Houghton, Ltd., Sidney Street.

Clitheroe.—Houses (36), Goosebutts and Haylurst Street sites (£47,000); Hawthorne Bros., builders, 36, Conway Avenue, Cleveleys, Blackpool.

Croydon.—Dwellings (88), Duppas Avenue, Central Hill and Wilford Road; borough engineer.

Derby.—Six blocks of flats at Mackworth estate; G. Wimpey & Co., Ltd., London.

Doncaster.—Houses (28), Cantley estate; J. S. Pott, 6, Church Lane, Bessacarr.

Dudley.—Houses (50), Brewery Fields; borough surveyor.

East Sussex.—Schools at West Blatchington, Hove, and at Rye; J. Catchpole, county architect, County Hall, Lewes.

Fleetwood.—Houses (74), West View estate; Brown & Jackson, Ltd., Fleetwood.

Harrogate.—School of Art, Victoria Avenue and West Park site; West Riding county architect, Wakefield.

Hatton (Warwick).—Two pavilions (40 beds), in grounds of the Central Hospital (£60,000); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Hayes and Harlington.—Houses (46), Pinkwell Lane, Bourne Farm estate; A. E. Higgins, clerk to U.D.C., Town Hall, Hayes.

Hendon.—Factory extensions; Rawlplug Co., Ltd., Hale Lane, N.W.7.

Hereford.—Aluminium bungalows (72), Putson estate; borough surveyor, Town Hall.

Hexham.—Houses (32), Newborough, Allendale and Ovingham; R.D.C. surveyor.

Hunts.—Proposed conversion of Old Grammar School, Ramsey, into county infants' school (£23,000); county architect, Huntingdon.

Home for old people, North Hunts (£21,660); county architect.

Kendal.—Extensions and alterations to Helme Chase Maternity Home (£58,000); Manchester Regional Hospital Board, Sunlight House, Quay Street, Manchester, 3.

Lancashire.—Extensions to Park Hotel, Preston, as offices (£90,000); county architect, Preston.

Littleborough.—Houses (38), Calderbrook Road; G. F. Wild, U.D.C. surveyor.

Liverpool.—Extensions to Royal Children's Hospital, including treatment block, lecture rooms, out-patients' and X-ray departments; regional architect, Alder Hey Hospital, West Derby, Liverpool, 12.

New medical school at University; Weightman and Bullen, architects, Liverpool.

London.—Nine-storey press offices at St. Andrew's Street (£400,000) for the Morning Advertiser, Ltd.; Trollope & Colls, Ltd., builders, 41/44, Great Queen Street, W.C.2.

Battersea.—Offices, warehouses, staffrooms, etc., Nine Elms Lane, for Farmiloe, Ltd.; Dyneley, Luker and Moore, architects and surveyors, 1, Lincoln's Inn Fields, W.C.2.

Islington.—Maisonnettes and shops, Pembroke Street (£39,072) for T.C.; Allen Fairhead & Sons, builders, Sydney Road, Enfield.

Manchester.—Rebuilding work at city abattoir (£60,000); Wm. Gornall & Sons, Ltd., Ellesmere Street, Bolton.

Mansfield.—Conversion work at Abbott Road Hostel for T.C. (£10,043); R. Kirk (Mansfield), Ltd., George Street.

Menai Bridge.—Houses, flats and shops (£50,986) for U.D.C.; R. J. Burr, Anglesey.

Middlesbrough.—Children's home, Sandford Close; borough engineer, Municipal Buildings.

Middleton.—Houses (90), Acresfield Road site; W. F. Mitchell, Ltd., Ellesmere Park, Eccles.

Newcastle-on-Tyne.—New offices and works extension for T. Clements & Sons, contractors, Selborne Gardens; Cackett, Burns Dick and McKellar, 21, Ellison Place, Newcastle.

Newmarket.—Pathological laboratory and extensions to X-ray department, White Lodge Hospital, for East Anglian Regional Hospital Board; P. Bicknell, architect, Trumpington Street, Cambridge.

North Shields.—Rebuilding fish oil factory for Irvin & Sons; Tasker and Child, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Northumberland.—First instalment of plan for new technical college at Ashington for the C.C. (£198,000); J. W. Urpeth, builder, Bedlington

Old people's hostels for the C.C. at Low Willington Farm, Wallsend and at Bebside, Blyth; county architect, County Hall, Newcastle.

Secondary modern school at Newburn and county modern school at Prudhoe; county architect.

Northwich.—Houses at Leftwich site for U.D.C.; W. E. Jones, Ltd., Northwich (34 houses) and Kemps, Ltd., Altrincham (16).

Oldbury.—Houses (92), Brandhall estate; borough surveyor.

St. Neots (Hunts).—Houses (22); U.D.C. surveyor.

Salford.—Erection of Stowell Memorial C.E. School; Moston Brick & Building Co., Collyhurst, Manchester.

Tyldesley (Lancs).—Houses (40), Shakerley estate; U.D.C. surveyor, Town Hall.

Uxbridge.—County primary school, Sussex Road, Ickenham (£51,368); A. E. Prowting, Ltd., builders, 127, High Street, Ruislip.